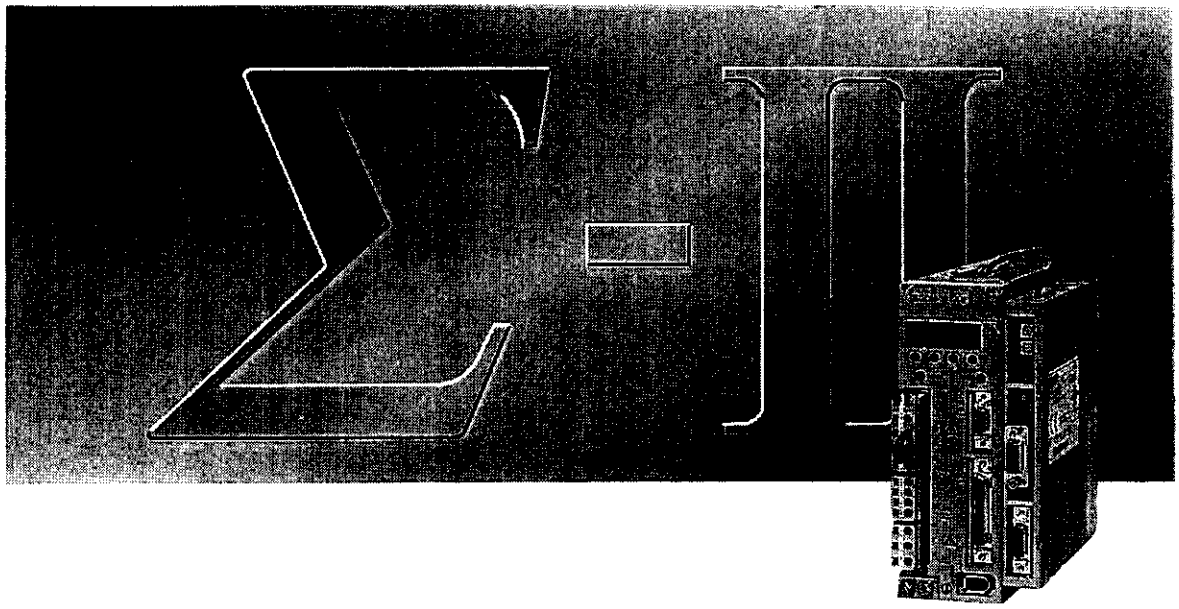
Σ-Ⅱ SERIES SGDH

PROFIBUS-DP INTERFACE UNIT

USER'S MANUAL

MODEL: JUSP-NS500



YASKAWA

MANUAL NO. SIE-C718-8

Safety Information

The following conventions are used to indicate precautions in this manual. Failure to heed precautions provided in this manual can result in serious or possibly even fatal injury or damage to the products or to related equipment and systems.

⚠ **WARNING** Indicates precautions that, if not heeded, could possibly result in loss of life or serious injury.

⚠ **Caution** Indicates precautions that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

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Visual Aids

The following aids are used to indicate certain types of information for easier reference.

◀EXAMPLE▶ Indicates application examples.

Indicates supplemental information.

IMPORTANT Indicates important information that should be memorized.

- Explains difficult to understand terms and terms that have not been explained before.

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Overview

■ About this Manual

This manual provides the following information for the Σ-II Series SGM□H/SGDH Servodrives with a JUSP-NS500 PROFIBUS-DP Interface Unit (hereafter called the NS500 Unit) mounted. The NS500 Unit is an Option Unit.

- Procedures for installing and wiring the NS500 Unit
- Specifications and methods for SERVOPACK PROFIBUS-DP communications
- Procedures for setting parameters
- Information on the NSxxx Setup Tool
- Troubleshooting procedures

■ Related Manuals

Refer to the following manuals as required.

Read this manual carefully to ensure the proper use of Σ-II Series Servodrives. Also, keep this manual in a safe place so that it can be referred to whenever necessary.

Manual Name	Manual Number	Contents
Σ-II Series SGM□H/SGDH User's Manual Servo Selection and Data Sheets	SIE-S800-32.1	Describes the procedure used to select Σ-II Series Servodrives and capacities.
Σ-II Series SGM□H/SGDH User's Manual Design and Maintenance	SIE-S800-32.2	Provides detailed information on SGDH SERVOPACKs.

Using This Manual

■ Intended Audience

This manual is intended for the following users.

- Those designing Servodrive systems using PROFIBUS-DP.
- Those designing Σ-II Series Servodrive systems.
- Those installing or wiring Σ-II Series Servodrives.
- Those performing trial operation or adjustments of Σ-II Series Servodrives.
- Those maintaining or inspecting Σ-II Series Servodrives.

■ Description of Technical Terms

In this manual, the following terms are defined as follows:

- **NS500 Unit** = JUSP-NS500
- **Servomotor** = Σ-II Series SGMAH, SGMPH, SGMGH, SGMSH, SGMDH, or SGMUH servomotor.
- **SERVOPACK** = Σ-II Series SGDH-□□□E SERVOPACK.
- **Servodrive** = A set including a servomotor and Servo Amplifier.
- **Servo System** = A servo control system that includes the combination of a Servodrive with a host computer and peripheral devices.

■ Indication of Reverse Signals

In this manual, the names of reverse signals (ones that are valid when low) are written with a forward slash (/) before the signal name, as shown in the following examples:

- /S-ON
- /P-CON

Safety Precautions

The following precautions are for checking products upon delivery, installation, wiring, operation, maintenance and inspections.

■ Checking Products upon Delivery

⚠ CAUTION

- Always use the servomotor and SERVOPACK in one of the specified combinations.
  Not doing so may cause fire or malfunction.

■ Installation

⚠ CAUTION

- Never use the products in an environment subject to water, corrosive gases, inflammable gases, or combustibles.
  Doing so may result in electric shock or fire.

■ Wiring

⚠ WARNING

- Connect the SERVOPACK ground terminal effectively to a system grounding conductor or grounding electrode (100 Ω or less).
  Improper grounding may result in electric shock or fire.

⚠ CAUTION

- Do not connect a three-phase power supply to SERVOPACK U, V, or W output terminals.
  Doing so may result in injury or fire.
- Securely fasten the power supply terminal screws and motor output terminal screws.
  Not doing so may result in fire.

■ Operation

⚠ WARNING

- Never touch any rotating motor parts while the motor is running.

  Doing so may result in injury.

⚠ CAUTION

- Conduct trial operation on the servomotor alone with the motor shaft disconnected from machine to avoid any unexpected accidents.

  Not doing so may result in injury.

- Before starting operation with a machine connected, change the settings to match the parameters of the machine.

  Starting operation without matching the proper settings may cause the machine to run out of control or malfunction.

- Before starting operation with a machine connected, make sure that an emergency stop can be applied at any time.

  Not doing so may result in injury.

- Do not touch the heat sinks during operation.

  Doing so may result in burns due to high temperatures.

■ Maintenance and Inspection

⚠ WARNING

- Never touch the inside of the SERVOPACKs.

  Doing so may result in electric shock.

- Do not remove the panel cover while the power is ON.

  Doing so may result in electric shock.

- Do not touch terminals for five minutes after the power is turned OFF.

  Residual voltage may cause electric shock.

⚠ CAUTION

- Do not disassemble the servomotor.

  Doing so may result in electric shock or injury.

- Do not attempt to change wiring while the power is ON.

  Doing so may result in electric shock or injury.

■ General Precautions

Note the following to ensure safe application.

- The drawings presented in this manual are sometimes shown without covers or protective guards. Always replace the cover or protective guard as specified first, and then operate the products in accordance with the manual.
- The drawings presented in this manual are typical examples and may not match the product you received.
- This manual is subject to change due to product improvement, specification modification, and manual improvement. When this manual is revised, the manual code is updated and the new manual is published as a next edition. The edition number appears on the front and back covers.
- If the manual must be ordered due to loss or damage, inform your nearest Yaskawa representative or one of the offices listed on the back of this manual.
- Yaskawa will not take responsibility for the results of unauthorized modifications of this product. Yaskawa shall not be liable for any damages or troubles resulting from unauthorized modification.

1

Checking Products and Part Names

This chapter describes the procedure for checking Σ-II Series products and the NS500 Unit upon delivery. It also describes the names of product parts.

1.1 Checking Products on Delivery ..... 1 -2
1.2 Product Part Names ..... 1 -4
1.3 Mounting the NS500 Unit ..... 1 -5

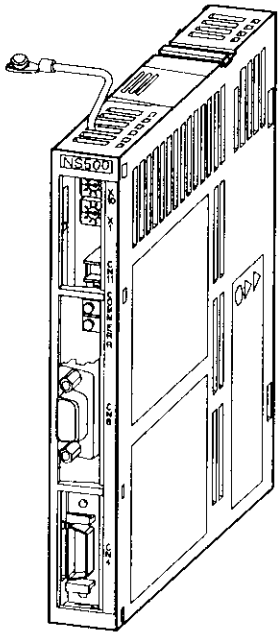
1.1 Checking Products on Delivery

The following procedure is used to check products upon delivery. Check the following items when products are delivered.

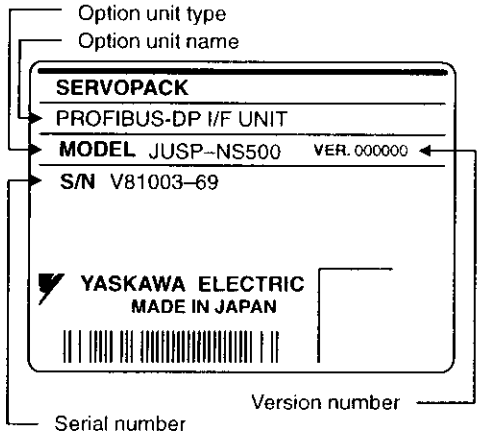
Check Items	Comments
Are the delivered products the ones that were ordered?	Check the model numbers marked on the nameplates of the NS500 Unit. (Refer to the descriptions of model numbers on following pages)
Is there any damage?	Check the overall appearance, and check for damage or scratches that may have occurred during shipping.
Can the NS500 Unit be installed on the SERVOPACK used?	Check the model number given on the SERVOPACK nameplate. The model number must contain "SGDH" and "E" as shown below to support the NS500 Unit. SGDH-□□□E-□

If any of the above items are faulty or incorrect, contact your Yaskawa sales representative or the dealer from whom you purchased the products.

■ External Appearance and Nameplate Example

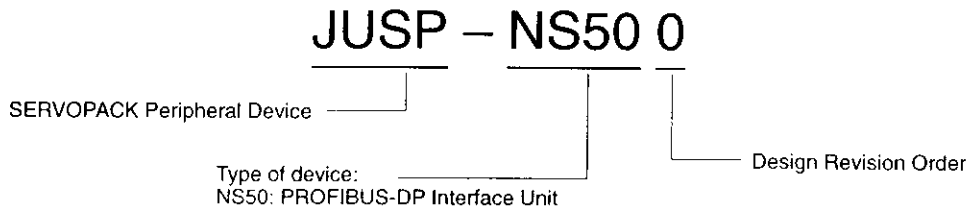


NS500 Unit



■ Model Number

NS500 Unit



1.2 Product Part Names

The following diagram illustrates the part names of the NS500 Unit.

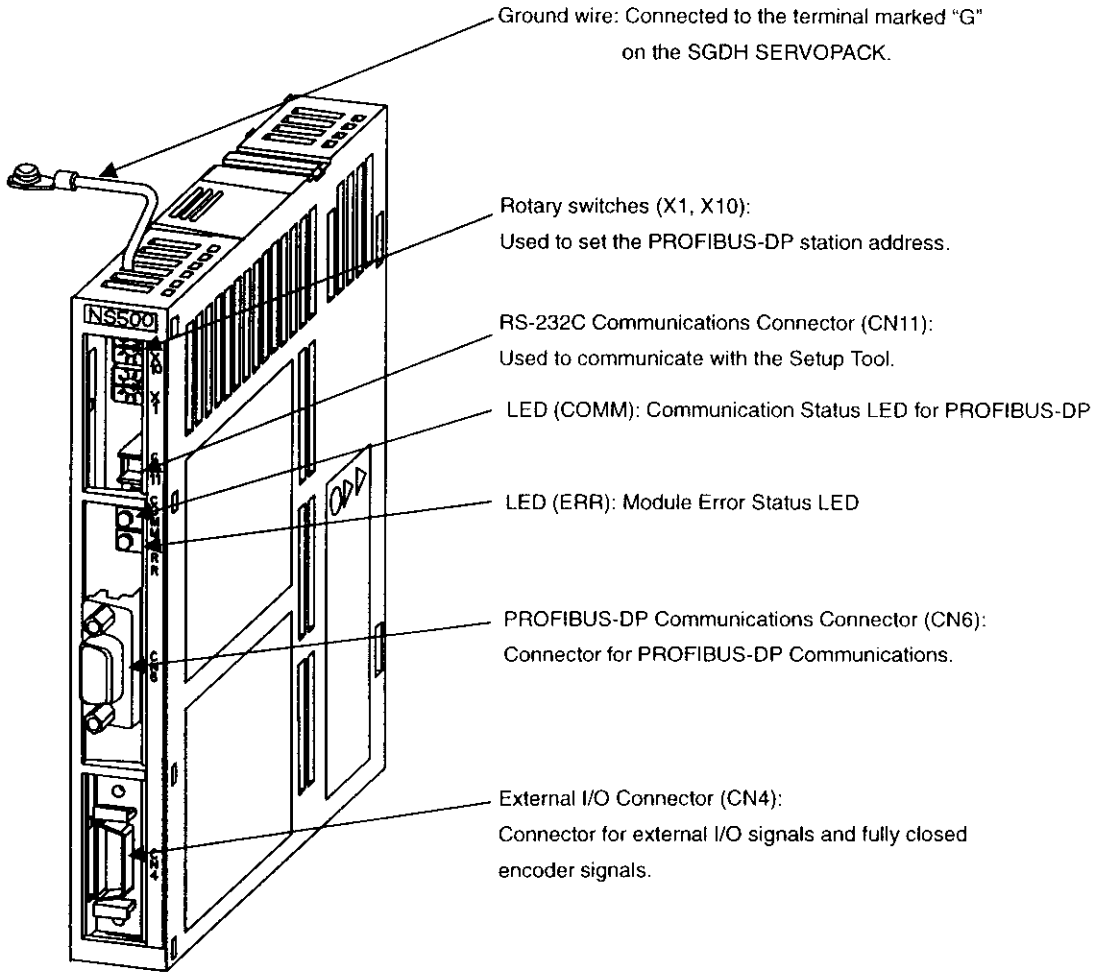

Ground wire: Connected to the terminal marked "G" on the SGDH SERVOPACK.
Rotary switches (X1, X10): Used to set the PROFIBUS-DP station address.
RS-232C Communications Connector (CN11): Used to communicate with the Setup Tool.
LED (COMM): Communication Status LED for PROFIBUS-DP
LED (ERR): Module Error Status LED
PROFIBUS-DP Communications Connector (CN6): Connector for PROFIBUS-DP Communications.
External I/O Connector (CN4): Connector for external I/O signals and fully closed encoder signals.
NS500
X1
X10
COMM
ERR
CN6
CN4

Figure 1.1 NS500 Unit

1.3 Mounting the NS500 Unit

This section describes how to mount a NS500 Unit on the SGDH SERVOPACK.

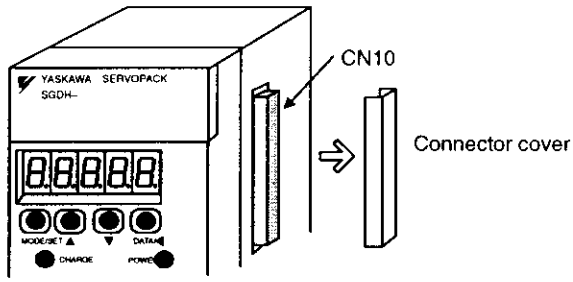
Prepare the screws for connecting the ground wire as shown in the following table:

Mounting Type	SERVOPACK Models	Screw	Remarks
Base Mounted	SGDH-A3 to 02BE SGDH-A3 to 10AE	M3 x 10 round-head screw (spring or flat washer)	Prepared by customer
	SGDH-15 to 50AE SGDH-05 to 30DE	M4 x 10 round-head screws (spring or flat washer)	Prepared by customer
	SGDH-60/75AE	M4 x 8 round-head screw (spring or flat washer)	Use front panel fixer screws
Rack Mounted	SGDH-A3 to 02BE-R SGDH-A3 to 50AE-R SGDH-05 to 30DE-R	M4 x 6 round-head screws (spring or flat washer)	Prepared by customer (see note)
Duct Vent	SGDH-60/75AE-P	M4 x 8 round-head screw (spring or flat washer)	Use front panel fixer screws

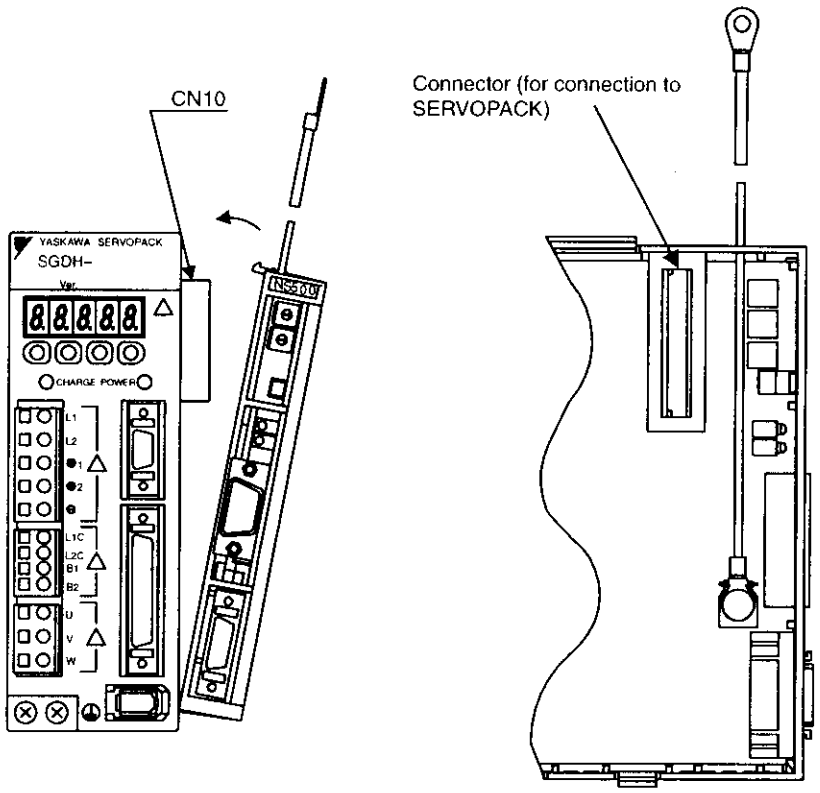
Note: Be sure to use spring washers or flat washers. Failure to do so may result in the screws for connecting the ground wire protruding behind the flange, preventing the SERVOPACK from being mounted.

By mounting NS500 Unit, the SGDH SERVOPACK can be used in a DeviceNet network. Use the following procedure to ensure NS500 Units are mounted correctly.

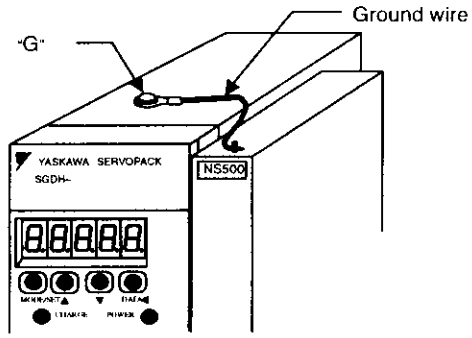
1. Remove the connector cover from the CN10 connector on the SERVOPACK.



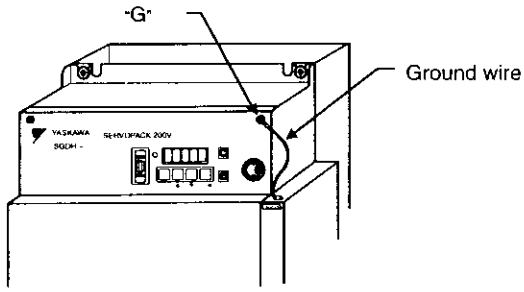
2. Mount the NS500 Unit on the SERVOPACK.



3. For grounding, connect a ground wire of the NS500 Unit to the point marked "G" on the SERVOPACK.

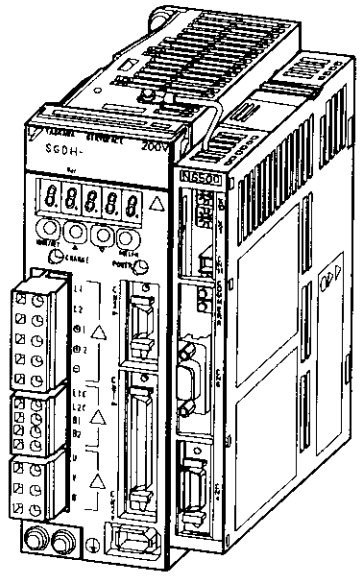


For SERVOPACK 30 W to 5.0 kW



For SERVOPACK 6.0 kW to 7.5 kW

When the NS500 Unit has been mounted correctly, the SERVOPACK will appear as shown in the following diagram.



2

Installation

This chapter describes precautions for Σ-II Series product installation.

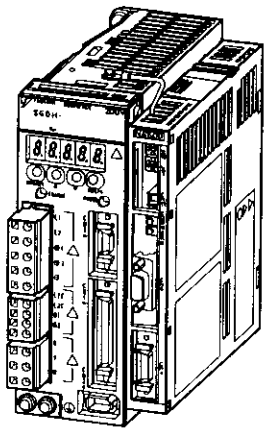
The SGDH SERVOPACKs are base-mounted servo amplifiers. Incorrect installation will cause problems. Always observe the installation precautions shown in this chapter.

2.1 Storage Conditions ..... 2 -2
2.2 Installation Site ..... 2 -2
2.3 Orientation ..... 2 -3
2.4 Installation ..... 2 -4

2.1 Storage Conditions

Store the SERVOPACK within the following temperature range when it is stored with the power cable disconnected.

Temperature range: –20 to 85°C



Σ - II Series SGDH SERVOPACK
with NS500 Unit mounted

2.2 Installation Site

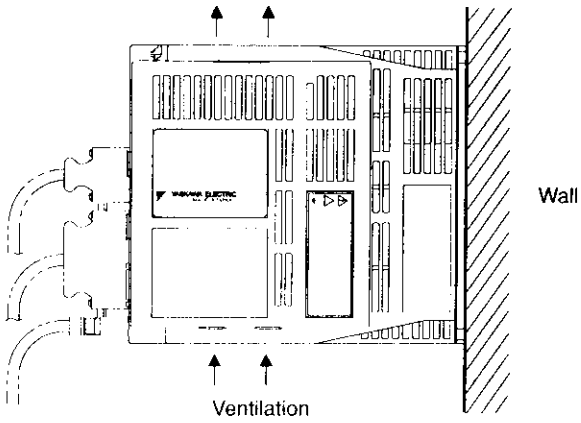
Take the following precautions at the installation site.

Situation	Installation Precaution
Installation in a Control Panel	Design the control panel size, unit layout, and cooling method so that the temperature around the SERVOPACK does not exceed 55°C.
Installation Near a Heating Unit	Minimize heat radiated from the heating unit as well as any temperature rise caused by natural convection so that the temperature around the SERVOPACK does not exceed 55°C.
Installation Near a Source of Vibration	Install a vibration isolator beneath the SERVOPACK to avoid subjecting it to vibration.
Installation at a Site Exposed to Corrosive Gas	Corrosive gas does not have an immediate effect on the SERVOPACK, but will eventually cause electronic components and contactor-related devices to malfunction. Take appropriate action to avoid corrosive gas.
Other Situations	Do not install the SERVOPACK in hot or humid locations, or locations subject to excessive dust or iron powder in the air.

2.3 Orientation

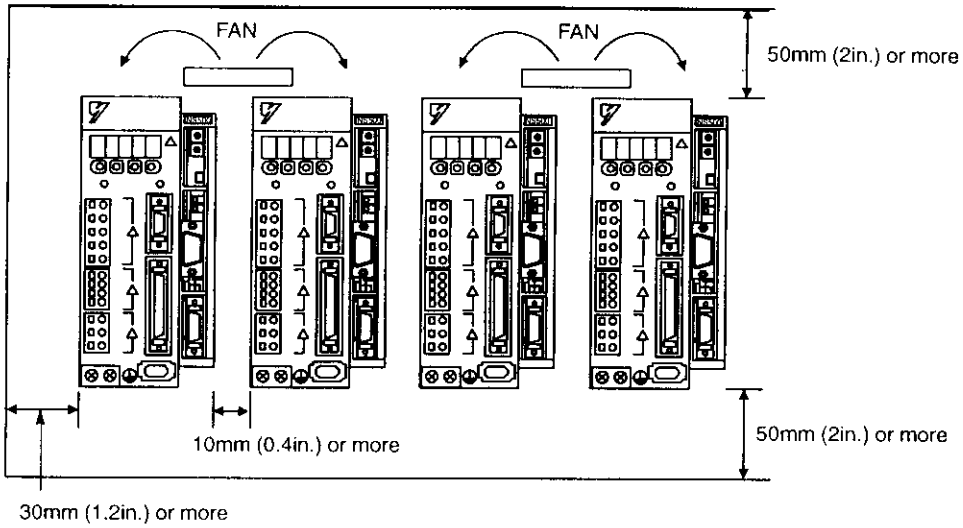
Install the SERVOPACK perpendicular to the wall as shown in the figure. The SERVOPACK must be oriented this way because it is designed to be cooled by natural convection or cooling fan.

Secure the SERVOPACK using 2 to 4 mounting holes. The number of holes depends on the SERVOPACK capacity.



2.4 Installation

Follow the procedure below to install multiple SERVOPACKs side by side in a control panel.



■ SERVOPACK Orientation

Install the SERVOPACK perpendicular to the wall so that the front panel (containing connectors) faces outward.

■ Cooling

As shown in the figure above, provide sufficient space around each SERVOPACK for cooling by cooling fans or natural convection.

■ Side-by-side Installation

When installing SERVOPACKs side by side as shown in the figure above, provide at least 10 mm (0.39 in) between and at least 50 mm (1.97 in) above and below each SERVOPACK. Install cooling fans above the SERVOPACKs to avoid excessive temperature rise and to maintain even temperature inside the control panel.

■ Environmental Conditions in the Control Panel

- Ambient Temperature: 0 to 55°C
- Humidity: 90% or less
- Vibration: 4.9 m/s^2
- Condensation and Freezing: None
- Ambient Temperature for Long-term Reliability: 45°C max.

3

Connectors

This chapter describes the procedure used to connect Σ-II Series products to peripheral devices when NS500 Unit is mounted and gives typical examples of I/O signal connections.

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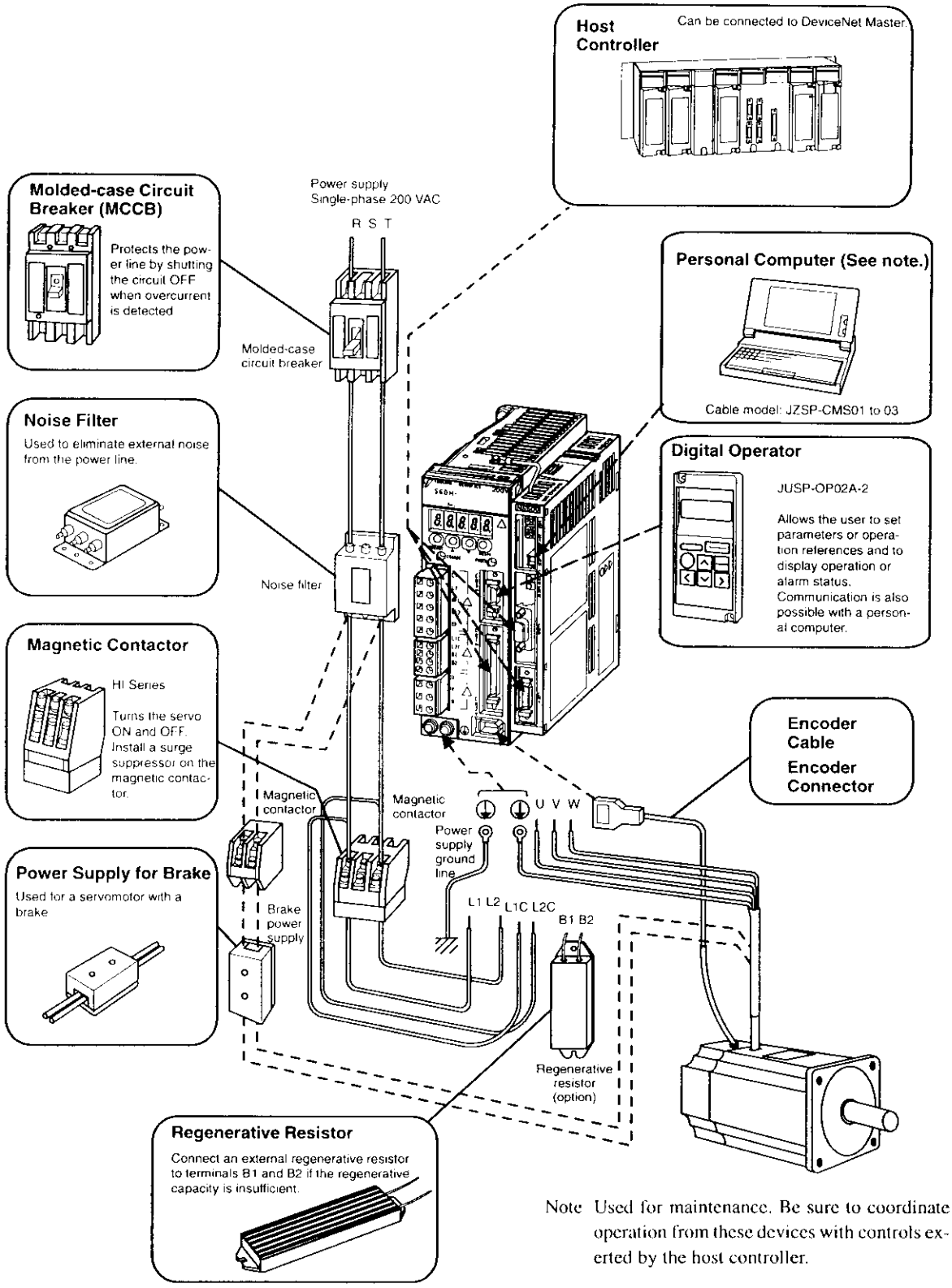
3.1 Connecting to Peripheral Devices

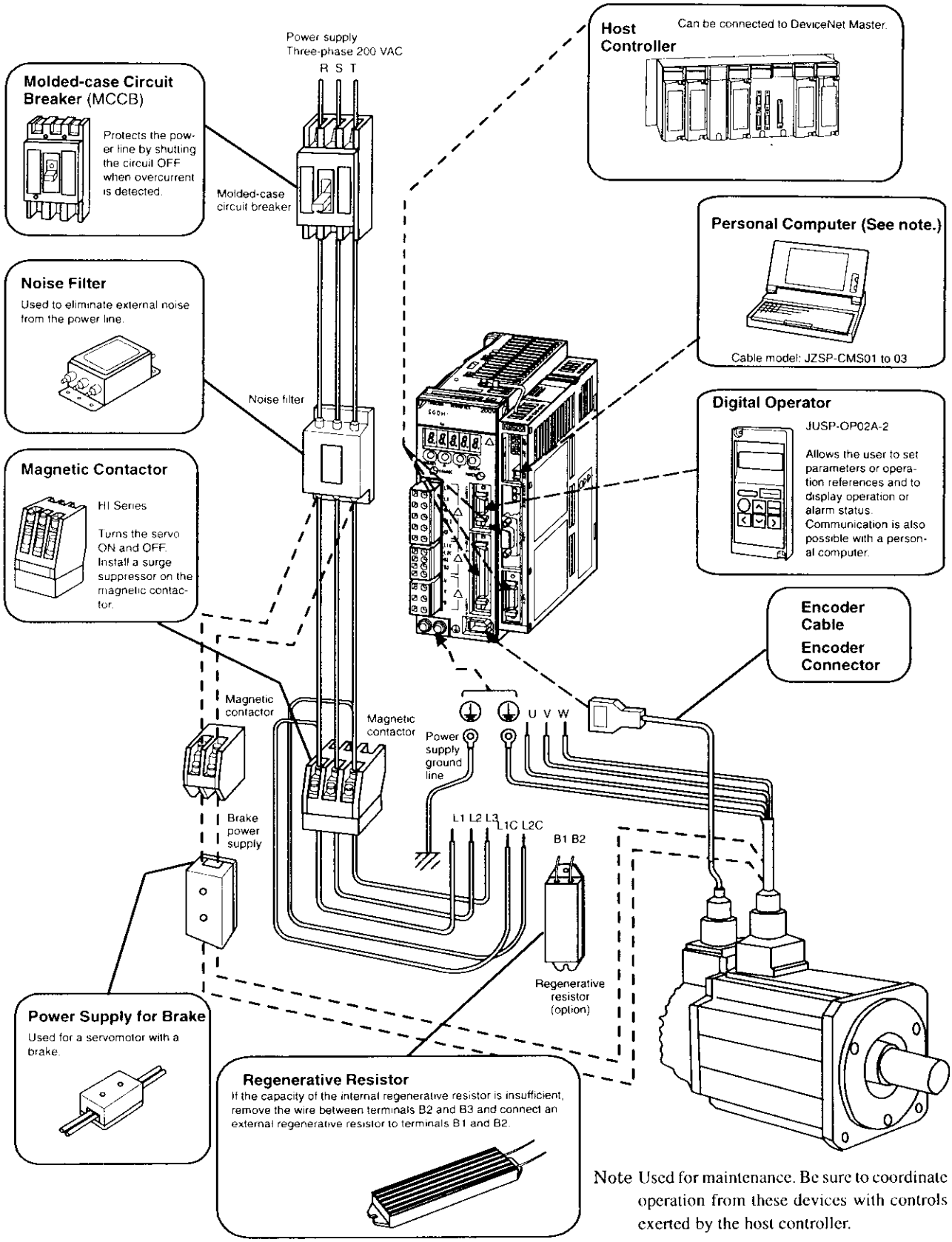
This section provides examples of standard Σ-II Series product connections to peripheral devices. It also briefly explains how to connect each peripheral device.

3.1.1 Single-phase (100 V or 200 V) Main Circuit Specifications


Host Controller
Can be connected to DeviceNet Master
Molded-case Circuit Breaker (MCCB)
Protects the power line by shutting the circuit OFF when overcurrent is detected
Power supply
Single-phase 200 VAC
R S T
Molded-case circuit breaker
Personal Computer (See note.)
Cable model: JZSP-CMS01 to 03
Noise Filter
Used to eliminate external noise from the power line.
Noise filter
Digital Operator
JUSP-OP02A-2
Allows the user to set parameters or operation references and to display operation or alarm status. Communication is also possible with a personal computer.
Magnetic Contactor
HI Series
Turns the servo ON and OFF. Install a surge suppressor on the magnetic contactor.
Magnetic contactor
Magnetic contactor
Encoder Cable
Encoder Connector
U V W
Power supply ground line
Power Supply for Brake
Used for a servomotor with a brake
Brake power supply
L1 L2 L1C L2C
B1 B2
Regenerative resistor (option)
Regenerative Resistor
Connect an external regenerative resistor to terminals B1 and B2 if the regenerative capacity is insufficient.

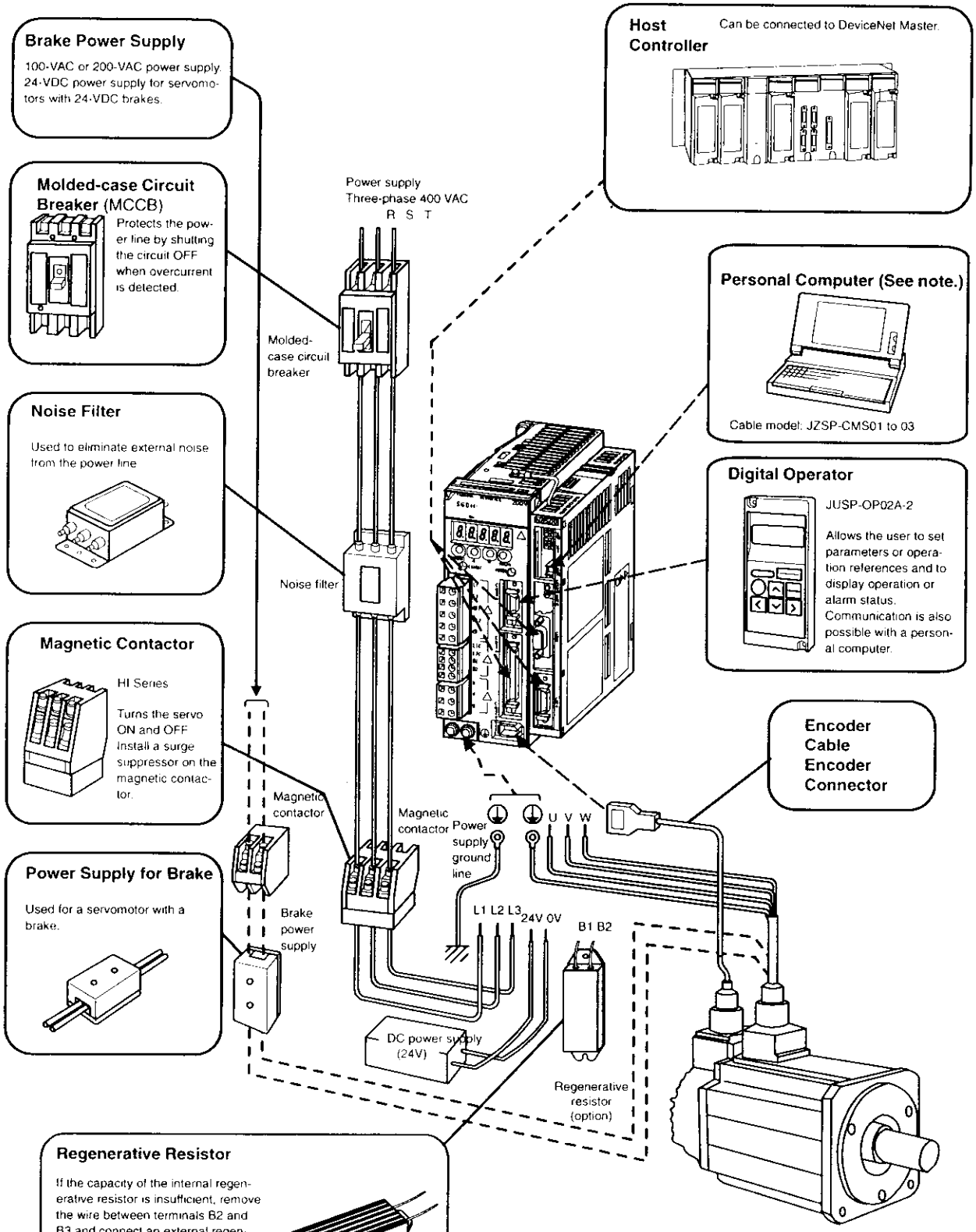
Note Used for maintenance. Be sure to coordinate operation from these devices with controls exerted by the host controller.

3.1.2 Three-phase, 200-V Main Circuit Specifications


Power supply
Three-phase 200 VAC
R S T
Molded-case Circuit Breaker (MCCB)
Protects the power line by shutting the circuit OFF when overcurrent is detected.
Molded-case circuit breaker
Noise Filter
Used to eliminate external noise from the power line.
Noise filter
Magnetic Contactor
HI Series
Turns the servo ON and OFF. Install a surge suppressor on the magnetic contactor.
Host Controller
Can be connected to DeviceNet Master.
Personal Computer (See note.)
Cable model: JZSP-CMS01 to 03
Digital Operator
JUSP-OP02A-2
Allows the user to set parameters or operation references and to display operation or alarm status. Communication is also possible with a personal computer.
Encoder Cable
Encoder Connector
Magnetic contactor
Magnetic contactor
Power supply ground line
U V W
Brake power supply
L1 L2 L3
L1C L2C
B1 B2
Regenerative resistor (option)
Power Supply for Brake
Used for a servomotor with a brake.
Regenerative Resistor
If the capacity of the internal regenerative resistor is insufficient, remove the wire between terminals B2 and B3 and connect an external regenerative resistor to terminals B1 and B2.

Note Used for maintenance. Be sure to coordinate operation from these devices with controls exerted by the host controller.

3.1.3 Three-phase, 400-V Main Circuit Specifications

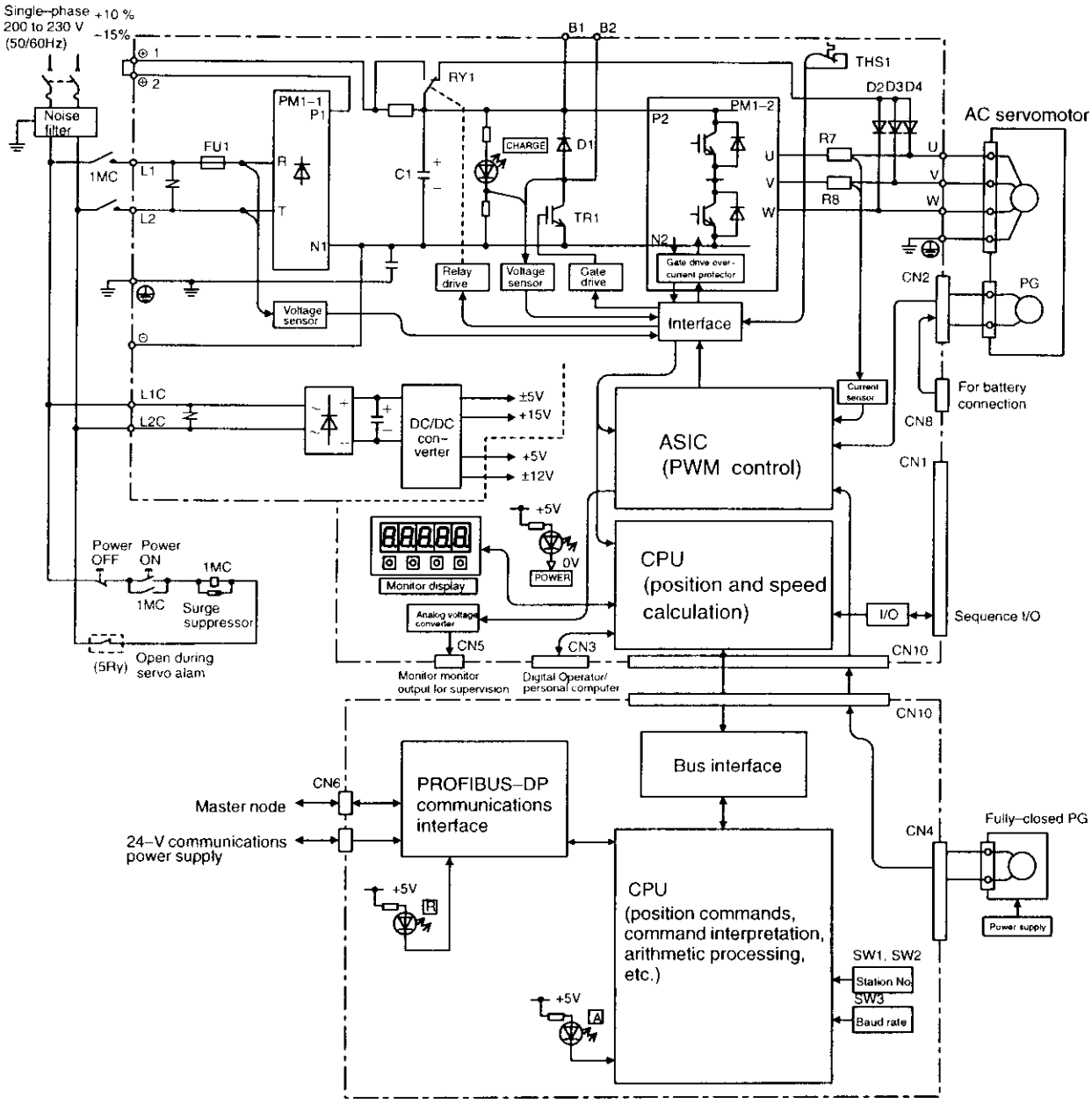

Brake Power Supply
100-VAC or 200-VAC power supply. 24-VDC power supply for servomotors with 24-VDC brakes.
Molded-case Circuit Breaker (MCCB)
Protects the power line by shutting the circuit OFF when overcurrent is detected.
Noise Filter
Used to eliminate external noise from the power line
Magnetic Contactor
HI Series
Turns the servo ON and OFF. Install a surge suppressor on the magnetic contactor.
Power Supply for Brake
Used for a servomotor with a brake.
Regenerative Resistor
If the capacity of the internal regenerative resistor is insufficient, remove the wire between terminals B2 and B3 and connect an external regenerative resistor to terminals B1 and B2.
Host Controller
Can be connected to DeviceNet Master.
Personal Computer (See note.)
Cable model: JZSP-CMS01 to 03
Digital Operator
JUSP-OP02A-2
Allows the user to set parameters or operation references and to display operation or alarm status. Communication is also possible with a personal computer.
Encoder Cable
Encoder Connector
Power supply
Three-phase 400 VAC
R S T
Molded-case circuit breaker
Noise filter
Magnetic contactor
Magnetic contactor
Power supply ground line
U V W
Brake power supply
L1 L2 L3
24V 0V
B1 B2
DC power supply (24V)
Regenerative resistor (option)

Note Used for maintenance. Be sure to coordinate operation from these devices with controls exerted by the host controller.

3.2 SERVOPACK Internal Block Diagrams

The following sections show an internal block diagram for the SERVOPACK with the NS500 Unit.

30 to 400 W 200-V and 30 to 200 W 100-V Models

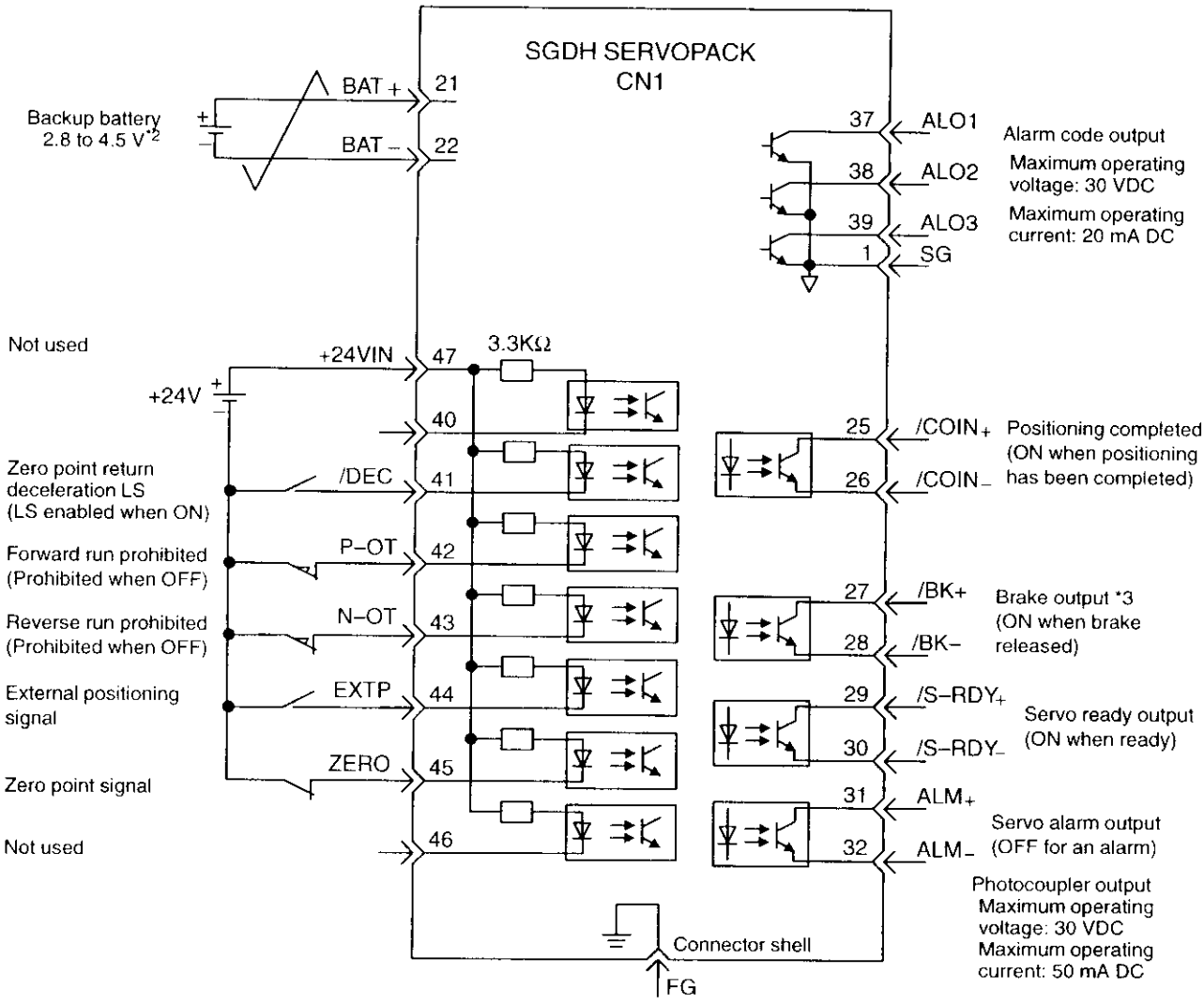


3.3 I/O Signals

This section describes I/O signals for the SERVOPACK with the NS500 Unit.

3.3.1 Connection Example of I/O Signal Connector (CN1)

The following diagram shows a typical example of I/O signal connections.



* 1. ‡P represents twisted-pair wires.

* 2. When using an absolute encoder, connect a backup battery only when there is no battery connected to the CN8.

* 3. Make signal allocations using parameters. (Refer to *6.1.2 Standard Settings for CN1 I/O Signals.*)

Figure 3.1 I/O Signal Connections for CN1 Connectors

3.3.2 I/O Signals Connector (CN1)

The following diagram shows the layout of CN1 terminals.

■ CN1 Terminal Layout

			1	SG	GND				26	/COIN-	Positioning complete output
2	SG	GND				27	/BK+ (Note 3)	Brake interlock output			
			3	–	–				28	/BK- (Note 3)	Brake interlock output
4	–	–				29	/S-RDY+	Servo ready output			
			5	–	–				30	/S-RDY-	Servo ready output
6	SG	GND				31	ALM+	Servo alarm output			
			7	–	–				32	ALM-	Servo alarm output
8	–	–				33	–	–			
10	SG	GND	9	–	–	35	–	–	34	–	–
			11	–	–				36	–	–
12	–	–				37	AL01	Alarm code output (open-collector output)			
			13	–	–				38	AL02	Alarm code output
14	–	–				39	AL03				
			15	–	–				40	–	–
16	–	–				41	/DEC	Zero point return deceleration LS input			
			17	–	–				42	P-OT	Forward drive prohibited input
18	–	–				43	N-OT	Reverse run prohibited input			
			19	–	–				44	EXTP	External positioning signal
20	–	–				45	ZERO	Zero point signal			
			21	BAT (+)	Battery (+)				46	–	–
22	BAT (–)	Battery (–)				47	+24VIN	External power supply input			
			23	–	–				48	–	–
24	–	–				49	–	–			
			25	/COIN +	Positioning complete output				50	–	–

Note 1. Do not use unused terminals for relays.

2. Connect the shield of the I/O signal cable to the connector shell.
The shield is connected to the FG (frame ground) at the SERVOPACK-end connector.

3. Make signal allocations using parameters. (Refer to *6.1.2 Standard Settings for CN1 I/O Signals.*)

■ CN1 Specifications

Specifications for SERVOPACK Connectors	Applicable Receptacles		
	Soldered	Case	Manufacturer
10250-52A2JL 50-p Right Angle Plug	10150-3000VE	10350-52A0-008	Sumitomo 3M Ltd.

3.3.3 I/O Signal Names and Functions

The following section describes SERVOPACK I/O signal names and functions.

■ Input Signals

Signal Name		Pin No.	Function
Common	/DEC	41	Zero point return deceleration NS: Deceleration LS for zero point return connected.
	P-OT N-OT	42 43	Forward run prohibited Reverse run prohibited Overtravel prohibited: Stops servomotor when movable part travels beyond the allowable range of motion.
	EXTP	44	External positioning signal: Signal used for external positioning connected.
	ZERO	45	Zero point
	+24VIN	47	Control power supply input for sequence signals: Users must provide the +24-V power supply. Allowable voltage fluctuation range: 11 to 25 V
	BAT (+) BAT (–)	21 22	Connecting pin for the absolute encoder backup battery. Connect to either CN8 or CN1.

■ Output Signals

Signal Name		Pin No.	Function
Common	ALM+ ALM–	31 32	Servo alarm: Turns OFF when an error is detected.
	/BK+ /BK–	27 28	Brake interlock: Output that controls the brake. The brake is released when this signal is ON.
	/S-RDY+ /S-RDY–	29 30	Servo ready: Turns ON if there is no servo alarm when the control/main circuit power supply is turned ON.
	ALO1 ALO2 ALO3	37 38 39 (1)	Alarm code output: Outputs 3-bit alarm codes. Open-collector: 30 V and 20 mA rating maximum
	FG	Shell	Connected to frame ground if the shield wire of the I/O signal cable is connected to the connector shell.
Position	/COIN+ /COIN–	25 26	Positioning completed (output in Position Control Mode): Turns ON when the number of error pulses reaches the set value. The setting is the number of error pulses set in reference units (input pulse units defined by the electronic gear).

Note 1. Pin numbers in parenthesis () indicate signal grounds.

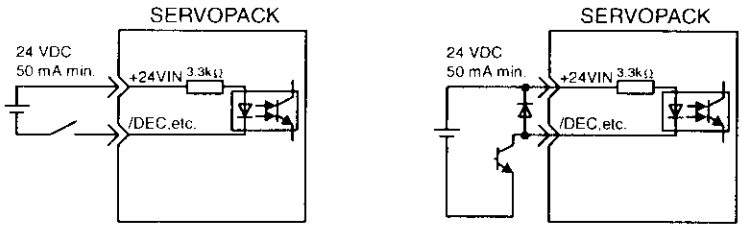
2. The functions allocated to /BK, /S-RDY, and /COIN can be changed via parameters. The /BK, /S-RDY, and /COIN output signals can be changed to /CLT, /VLT, /TGON, /WARN, or /NEAR signals.

3.3.4 Interface Circuits

The following diagram shows an example of connections between a host controller and the I/O signal for a SERVOPACK.

■ Sequence Input Circuit Interface

The sequence input circuit interface connects through a relay or open-collector transistor circuit. Select a low-current relay, otherwise a faulty contact will result.



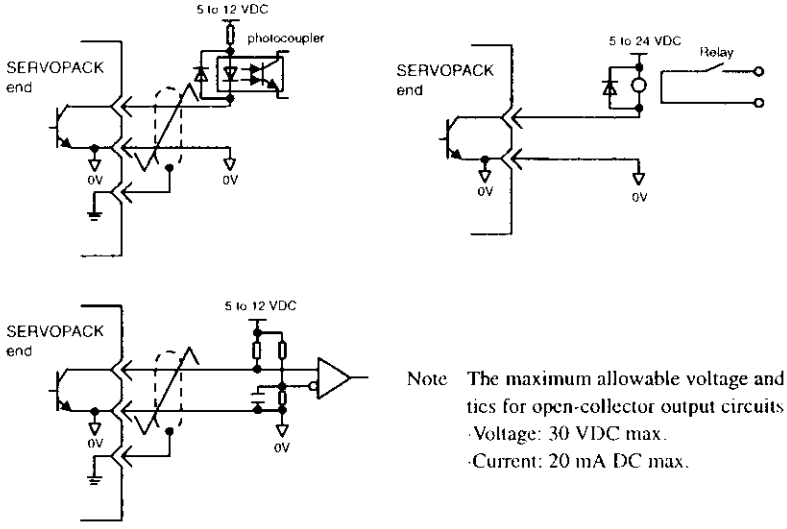
■ Output Circuit Interface

Any of the following three types of SERVOPACK output circuits can be used. Form an input circuit at the host controller that matches one of these types.

- Connecting to an Open-collector Output Circuit

  Alarm code signals are output from open-collector transistor output circuits.

  Connect an open-collector output circuit through a photocoupler, relay, or line receiver circuit.

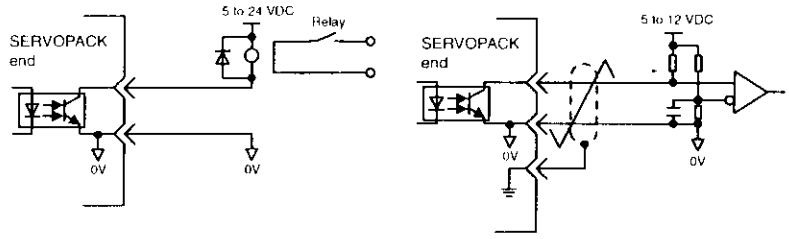


Note The maximum allowable voltage and current capacities for open-collector output circuits are as follows:
·Voltage: 30 VDC max.
·Current: 20 mA DC max.

- Connecting to a Photocoupler Output Circuit

  Photocoupler output circuits are used for servo alarm, servo ready, and other sequence output signal circuits.

  Connect a photocoupler output circuit through a relay or line receiver circuit.



Note The maximum allowable voltage and current capacities for photocoupler output circuits are as follows:
-Voltage: 30 VDC max.
-Current: 50 mA DC max.

3.4 I/O Signal Connections for NS500 Units (CN4)

The CN4 on an NS500 Unit is used for I/O signal and fully-closed encoder signal connections.

3.4.1 Connection Terminal Layout

The terminal layout and specifications for the CN4 are outlined below.

■ CN4 Terminal Layout

Pin No.	Signal	Description	Pin No.	Signal	Description
1	PG 0V	Signal ground	11	+24VIN	24-V common terminal for external input
2	PG 0V	Signal ground	12	NOTCH1+	Notch output 1
3	PG 0V	Signal ground	13	NOTCH1–	–
4	–	–	14	PC	Phase-C input
5	–	–	15	/PC	–
6	–	–	16	PA	Phase-A input
7	–	–	17	/PA	–
8	–	–	18	PB	Phase-B input
9	EMSTOP	Emergency stop input	19	/PB	–
10	NOTCH2+	Notch output 2	20	NOTCH2–	Notch output 2

Note 1. The PG power supply and battery must be supplied externally.

2. The FG is connected to the connector shell.

■ Connector Specifications

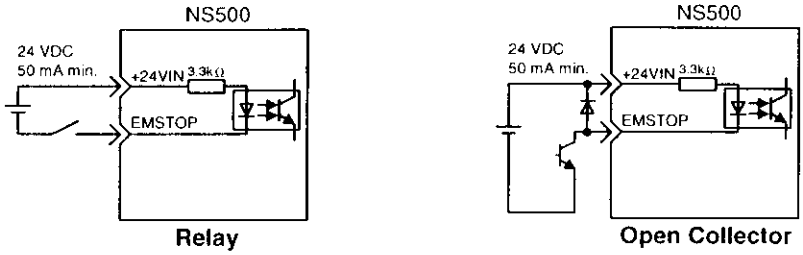
Part	Signal	Manufacturer
Connector	10120–3000VE (20P)	Sumitomo 3M Ltd.
Connector shell	10320–52A0–008	–

3.4.2 I/O Signal Interface Circuits

The following diagram shows an example of connections between a host controller and the I/O signals for an NS500 Unit.

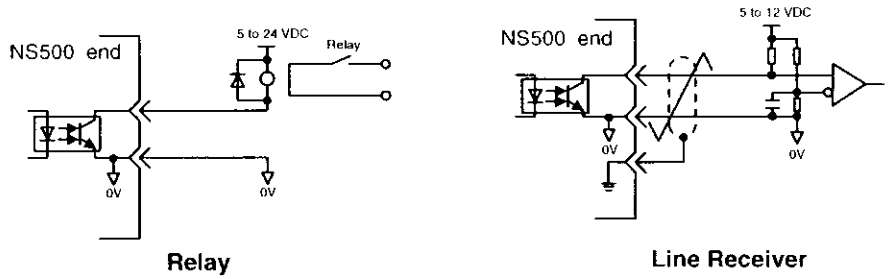
■ Sequence I/O Circuit Interface

The sequence input circuit interface connects through a relay or open-collector transistor circuit. Select a low-current relay, otherwise a faulty contact will result.



■ Output Circuit Interface

Notch output signals are used for photocoupler output circuits. Connect the notch output signals to relays or line receiver circuits.

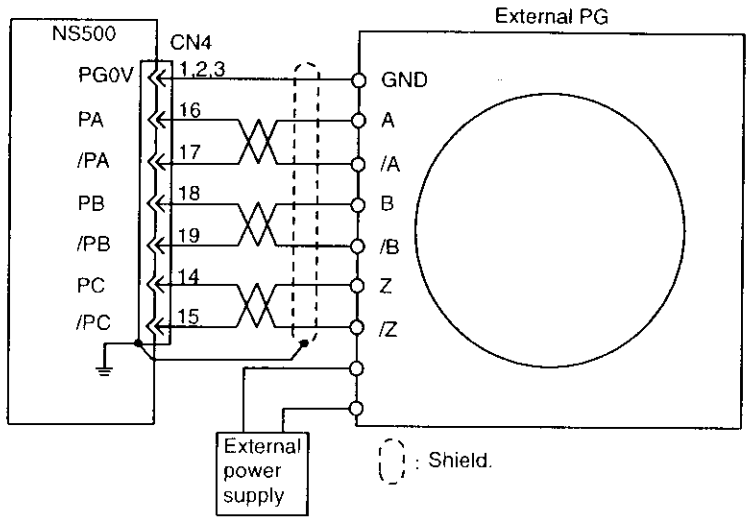


Note The maximum allowable voltage and current capacity for photocoupler output circuits are as follows:

- Voltage: 30 VDC max.
- Current: 50 mA DC max.

3.4.3 Fully-closed Encoder Connection Example

The following diagram shows a connection example for a fully-closed encoder.



3.5 Connectors for PROFIBUS-DP Communications

SUB-D 9-pin connectors are used for PROFIBUS-DP connections.

Pin number	Symbol	Function
1	–	–
2	–	–
3	RXD/TXD-P	Receive/send data, positive
4	–	–
5	DGND	Ground
6	VP	+5 V
7	–	–
8	RXD/TXD-N	Receive/send data, negative
9	–	–

■ Cables for PROFIBUS-DP Communications

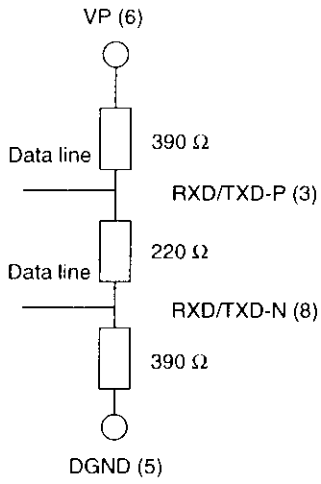
Use commercial PROFIBUS-DP cables. Type A cables are recommended. The maximum cable lengths when using type A cables are given in the table below.

Baud rate (kbps)	9.6	19.2	93.75	187.5	500	1500	12000
Maximum cable length (m)	1200	1200	1200	1000	400	200	100

The specifications for type A cables are given in the table below.

Item	Specifications
Impedance	135 to 165 Ω
Capacitance per Unit	< 30 pF/m
Loop resistance	110 Ω/m
Core diameter	0.64 mm
Core cross-sectional area	> 0.34 mm^2

Terminating resistances are required at both ends of the bus line as shown below.



The NS500 Unit does not have terminating resistance. Use the terminating resistance in the bus plug connector on the cable side for the NS500 Unit.

4

Parameter Settings

This chapter provides an outline and details of NS500 parameters.

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4.1.1 Outline of Parameters ..... 4 -2
4.1.2 Parameter Types ..... 4 -2
4.1.3 Editing Parameters ..... 4 -3
4.1.4 Effective Timing ..... 4 -3
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4.1 Parameters

4.1.1 Outline of Parameters

Parameters is the name given to the user constants that are required as the settings used to operate the NS500 Unit. You must set the optimum values for parameters according to the NS500 Unit and the machine to which the SGDH is mounted.

You can edit the NS500 Unit parameters using the NSxxx Setup Tool, DeviceNet Configurator, or host controller.

For parameters, refer to *Chapter 6 Parameter Settings* or the Σ-II *Series SGM□H/SGDH User's Manual Design and Maintenance* (SIE-S800-32.2).

4.1.2 Parameter Types

Parameters are classified depending on their purpose as follows:

- Unit parameters
- Zero Point Return parameters
- Machine system and peripheral device parameters
- Speed, acceleration, and deceleration parameters
- Positioning parameters
- Multi-speed positioning parameters
- Notch output positioning parameters

Parameters are further classified according to the priority of the setting, as shown below.

Table 4.1 Parameter Types

Type	Meaning
A	Parameters that must be set even when using the NS500 Unit in standard mode.
B	Parameters that must be set when using the NS500 Unit in special mode.
C	Parameters whose settings hardly ever need to be changed.

4.1.3 Editing Parameters

You can edit parameters using the following methods.

Table 4.2 Methods of Editing Parameters

Tools	Methods	Remarks
NSxxx Setup Tool	Select ***Option Parameter List*** from the Parameter Menu to read all the NS500 Unit parameters. After the parameters have been displayed, select the parameters you want to edit, and click the **Edit** Button to edit the parameters.	All changed parameters are stored in RAM, so they are erased when the power is turned OFF. Use the ***Module Reset*** Command to write the parameter data in RAM to the flash ROM.
Master Device	You can edit using 8-bytes commands from the Master Device.	All changed parameters are stored in RAM, so they are erased when the power is turned OFF. Execute the **Reset Service** for the Identity Object to write the parameter data in RAM to the flash ROM.

IMPORTANT

Parameters changed from each setting device are stored in RAM.
To save parameters in flash ROM after adjustments have been completed, execute the ***Module Reset*** Command in the NSxxx Setup Tool or execute the Reset Service to the Identity Object via DeviceNet.

4.1.4 Effective Timing

Not all parameters edited from the NSxxx Setup Tool or Master Device are effective immediately. Changed parameters are effective at one of the following two times.

Table 4.3 Effective Timing for Parameters

Timing	Control or Processing
Power-up	The values of all parameters are made effective at the following times. 1. When power is turned ON. 2. When the Module is reset from the NSxxx Setup Tool or via a command data.
Immediate	The values of changed parameters are made effective immediately. However, parameters will be stored in the Flash ROM at the following times. • When the Module is reset from the NSxxx Setup Tool or via a command data.

4.2 Parameter Tables

The following tables list the parameters.

If using the NSxxx Setup Tool or reading/writing using a command data, edit parameters using Pn□□□.

4.2.1 Unit Parameters

The unit parameter table is shown below.

No.	Name	Range	Units	Effective Timing	Default Value	Type
Pn810	Electronic Gear Ratio (Numerator)	1 to 10,000,000	---	Power-up	1	B
Pn811	Electronic Gear Ratio (Denominator)	1 to 10,000,000	---	Power-up	1	B

4

4.2.2 Zero Point Return Parameters

The table of zero point return parameters are shown below.

No.	Name	Range	Units	Effective Timing	Default Value	Type
Pn800	Zero Point Return Mode	0 to 3	---	Immediate	0	B
Pn801	Zero Point Return Function Selection	0 to 7	---	Power-up	1	B
Pn802	Feed Speed for Zero Point Return	1 to 240,000	1000 steps/min	Immediate	10,000	B
Pn803	Approach Speed for Zero Point Return	1 to 240,000	1000 steps/min	Immediate	1,000	B
Pn804	Creep Speed for Zero Point Return	1 to 240,000	1000 steps/min	Immediate	500	B
Pn805	Final Travel Distance for Zero Point Return	0 to 99,999,999	Steps	Immediate	0	B
Pn806	Output Width for Zero Point Return	0 to 32, 767	Step	Immediate	100	B
Pn809	Zero Point Offset	-99,999,999 to 99,999,999	Steps	Immediate	0	C
Pn80A	Accel/Decel Time for Zero Point Return	1 to 10,000	ms	Immediate	100	B

Note: 1. "Steps" means "reference unit." For reference unit details, refer to *4.3.1 Unit Parameters*.

2. If you set the reference unit to 0.001 mm, 1,000 steps/min becomes mm/min.

4.2.3 Machine System and Peripheral Device Parameters

The machine system and peripheral device parameter table is shown below.

No.	Name	Range	Units	Effective Timing	Default Value	Type
Pn812	Coordinate Type	0, 1	---	Immediate	0	C
Pn813	Reference units per Machine Rotation	1 to 1,500,000	---	Immediate	360,000	C
Pn814	Backlash Compensation	0 to 32,767	Steps	Immediate	0	C
Pn815	Backlash Direction	0, 1	Steps	Immediate	0	C
Pn816	Positive Software Limit	±99,999,999	---	Power-up	99999999	B
Pn817	Negative Software Limit	±99,999,999	Steps	Power-up	–99999999	B
Pn818	Machine Function Selection	0 to 3	---	Immediate	0	B
Pn819	Hardware Limit Signal Function Selection	0 to 3	---	Immediate	1	B
Pn81A	Hardware Limit Action Selection	0, 1, 2	---	Immediate	0	B
Pn81B	Emergency Stop Signal Function Selection	0 to 3	---	Immediate	1	B

Note: 1. "Steps" means "reference unit." For reference unit details, refer to *4.3.1 Unit Parameters*.

2. If you set the reference unit to 0.001 mm, 1,000 steps/min becomes mm/min.

4.2.4 Speed, Acceleration, and Deceleration Parameters

A table of speed, acceleration, and deceleration parameters is shown below.

No.	Name	Range	Units	Effective Timing	Default Value	Type
Pn821	Feed Speed for Positioning	1 to 240,000	1000 steps/min	Immediate	24,000	B
Pn822	Acceleration Time for Positioning	1 to 10,000	ms	Immediate	100	B
Pn823	Deceleration Time for Positioning	1 to 10,000	ms	Immediate	100	C
Pn824	Switch Speed for Second Accel/Decel for Positioning	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn825	Accel/Decel Time for Second Accel/Decel for Positioning	1 to 10,000	ms	Immediate	200	B
Pn826	Accel/Decel Type for Positioning	0 to 3	---	Immediate	0	B
Pn827	Feed Speed for External Positioning	1 to 240,000	1000 steps/min	Immediate	24,000	B
Pn829	Filter Selection	0 to 3	---	Immediate	0	B
Pn830	Constant Feed Reference Unit Selection	0, 1	---	Immediate	0	B
Pn831	Constant Feed Speed	1 to 240,000	1000 steps/min	Immediate	24,000	B
Pn832	Acceleration Time for Constant Feed	1 to 10,000	ms	Immediate	100	B
Pn833	Deceleration Time for Constant Feed	1 to 10,000	ms	Immediate	100	C
Pn834	Switch Speed for Constant Feed Second Accel/Decel	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn835	Accel/Decel Time for Constant Feed Second Accel/Decel	1 to 10,000	ms	Immediate	200	C

No.	Name	Range	Units	Effective Timing	Default Value	Type
Pn836	Accel/Decel Type for Constant Feed	0, 1, 2, 3	---	Immediate	0	B
Pn840	Time Constant for Exponential Accel/Decel	4 to 10,000	ms	Immediate	25	C
Pn841	Bias Speed for Exponential Accel/Decel	1 to 240,000	1000 steps/min	Immediate	0	C
Pn842	Time Constant of Travelling Average	4 to 10,000	ms	Immediate	25	C
Pn843	Maximum Feed Speed	1 to 240,000	1000 steps/min	Immediate	24,000	B
Pn844	Step Distance 1	0 to 99,999,999	Steps	Immediate	1	B
Pn845	Step Distance 2	0 to 99,999,999	Steps	Immediate	10	B
Pn846	Step Distance 3	0 to 99,999,999	Steps	Immediate	100	B
Pn847	Step Distance 4	0 to 99,999,999	Steps	Immediate	1,000	B

Note: 1. "Steps" means "reference unit." For reference unit details, refer to *4.3.1 Unit Parameters*.

2. If you set the reference unit to 0.001 mm, 1,000 steps/min becomes mm/min.

4.2.5 Positioning Parameters

The positioning parameter table is shown below.

No.	Name	Range	Units	Effective Timing	Default Value	Type
Pn850	Positioning Deadband	0 to 10,000	Steps	Immediate	5	A
Pn851	Positioning Timeout	0 to 100,000	ms	Immediate	0	A
Pn852	Positioning Proximity Detection Width	0 to 32,767	Steps	Immediate	10	B
Pn853	Direction for Rotation System	0, 1	---	Immediate	0	B
Pn854	Approach Speed for External Positioning	1 to 240,000	1,000 steps/min	Immediate	24,000	B
Pn855	Travel Distance for External Positioning	0 to 99,999,999	Steps	Immediate	0	B
Pn856	Function Selection for External Positioning	0 to 1	---	Power-up	1	B
Pn85A	Number of Stations	1 to 32,767	---	Immediate	1	B

Note: 1. "Steps" means "reference unit." For reference unit details, refer to *4.3.1 Unit Parameters*.

2. If you set the reference unit to 0.001 mm, 1,000 steps/min becomes mm/min.

4.2.6 Multi-speed Positioning Parameters

A table of multi-speed positioning parameters is shown below.

No.	Name	Range	Units	Effective Timing	Default Value	Type
Pn861	Number of Points for Speed Switching	0 to 16	–	Immediate	0	C
Pn862	Initial Feed Speed for Multi-speed Positioning	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn863	Speed Switching Position 1	0 to 99,999,999	Steps	Immediate	0	C
Pn864	Speed Switching Position 2	0 to 99,999,999	Steps	Immediate	0	C
Pn865	Speed Switching Position 3	0 to 99,999,999	Steps	Immediate	0	C
Pn866	Speed Switching Position 4	0 to 99,999,999	Steps	Immediate	0	C
Pn867	Speed Switching Position 5	0 to 99,999,999	Steps	Immediate	0	C
Pn868	Speed Switching Position 6	0 to 99,999,999	Steps	Immediate	0	C
Pn869	Speed Switching Position 7	0 to 99,999,999	Steps	Immediate	0	C
Pn86A	Speed Switching Position 8	0 to 99,999,999	Steps	Immediate	0	C
Pn86B	Speed Switching Position 9	0 to 99,999,999	Steps	Immediate	0	C
Pn86C	Speed Switching Position 10	0 to 99,999,999	Steps	Immediate	0	C
Pn86D	Speed Switching Position 11	0 to 99,999,999	Steps	Immediate	0	C
Pn86E	Speed Switching Position 12	0 to 99,999,999	Steps	Immediate	0	C
Pn86F	Speed Switching Position 13	0 to 99,999,999	Steps	Immediate	0	C
Pn870	Speed Switching Position 14	0 to 99,999,999	Steps	Immediate	0	C
Pn871	Speed Switching Position 15	0 to 99,999,999	Steps	Immediate	0	C
Pn872	Speed Switching Position 16	0 to 99,999,999	Steps	Immediate	0	C
Pn873	Switching Speed 1	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn874	Switching Speed 2	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn875	Switching Speed 3	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn876	Switching Speed 4	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn877	Switching Speed 5	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn878	Switching Speed 6	1 to 240,000	1000 steps/min	Immediate	24,000	C

No.	Name	Range	Units	Effective Timing	Default Value	Type
Pn879	Switching Speed 7	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn87A	Switching Speed 8	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn87B	Switching Speed 9	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn87C	Switching Speed 10	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn87D	Switching Speed 11	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn87E	Switching Speed 12	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn87F	Switching Speed 13	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn880	Switching Speed 14	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn881	Switching Speed 15	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn882	Switching Speed 16	1 to 240,000	1000 steps/min	Immediate	24,000	C

Note: 1. "Steps" means "reference unit." For reference unit details, refer to *4.3.1 Unit Parameters*.

2. If you set the reference unit to 0.001 mm, 1,000 steps/min becomes mm/min.

4.2.7 Notch Output Parameters

The notch output parameter table is shown below.

No.	Name	Range	Units	Effective Timing	Default Value	Type
Pn890	Notch Signal Output Position Setting	0, 1	–	Immediate	0	C
Pn891	Notch Signal Output Setting	0 to 3	–	Immediate	0	C
Pn892	Notch 1 Output Position Lower Limit	±99,999,999	Steps	Immediate	0	C
Pn893	Notch 1 Output Position Upper Limit	±99,999,999	Steps	Immediate	0	C
Pn894	Notch 2 Output Position Lower Limit	±99,999,999	Steps	Immediate	0	C
Pn895	Notch 2 Output Position Upper Limit	±99,999,999	Steps	Immediate	0	C

Note: 1. "Steps" means "reference unit." For reference unit details, refer to *4.3.1 Unit Parameters*.

2. If you set the reference unit to 0.001 mm, 1,000 steps/min becomes mm/min.

4.3 Parameter Details

4.3.1 Unit Parameters

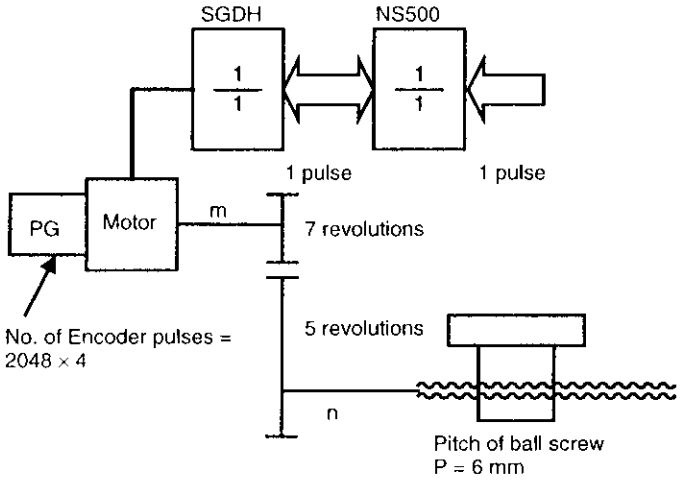
The unit for performing positioning using a NS500 Unit is determined by the following two parameters.

No.	Name	Range	Units	Effective Timing	Default Value	Type
Pn810	Electronic gear (numerator)	1 to 10,000,000	---	Power-up	1	B
Pn811	Electronic gear (denominator)	1 to 10,000,000	---	Power-up	1	B

The electronic gear function can be used to set the position command units equal to the amount of encoder pulses. The host controller can generate position commands in more familiar user-defined units such as millimeters or inches.

■ Not Using the Electronic Gear

If not using the electronic gear, set Pn810 and Pn811 to 1. This will set the reference unit to 1 pulse, so you must calculate the scale position units using the host controller.



IMPORTANT

In this manual, the reference unit explained in *Electronic Gear Settings When Using a Ball Screw* in *4.3.1 Unit Parameters* is based on a unit of 0.001 mm. The speed and other parameters must be interpreted as follows:

- Pn821: Feed Speed for Positioning (mm/min) → (1000 pulses/min)

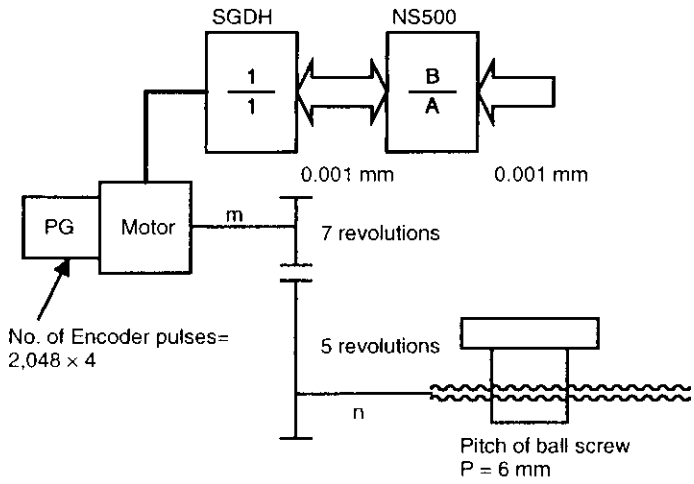
■ Electronic Gear Settings When Using a Ball Screw

If using a ball screw, first check the following specifications.

- Number of Encoder pulses
- Gear ratio
- Ball screw pitch

System Example

The following system example shows the formulas when the reference unit is set to 0.001 mm.



- $\text{REV} = \dfrac{\text{Travel distance of load per revolution (mm)}}{\text{Reference unit (mm)}} = \dfrac{6\ \text{mm}}{0.001\ \text{mm}} = 6000$

- A = (REV) × {Gear ratio (load rev.)} = 6000 × 5 = 30000
- B = (Encoder pulses) × (Pulse multiplier) × {Gear ratio (motor rev.)} = 2048 × 4 × 7 = 57344
- B/A = 57344/30000 = 1.911

Data ranges are shown below.

- A ≦ 10,000,000
- B ≦ 10,000,000
- 100 ≧ B/A ≧ 0.01

By storing the value of A in Pn811 and the value of B in Pn810, you can use the Electronic Gear function. These parameters are enabled when the power is turned ON. After you have changed the parameter, execute the Module Reset Command or the Reset Service to the Identity Object.

IMPORTANT

Setting B/A outside the range 0.01 to 100 may result in a misoperation. Make sure to set B and A within this range.

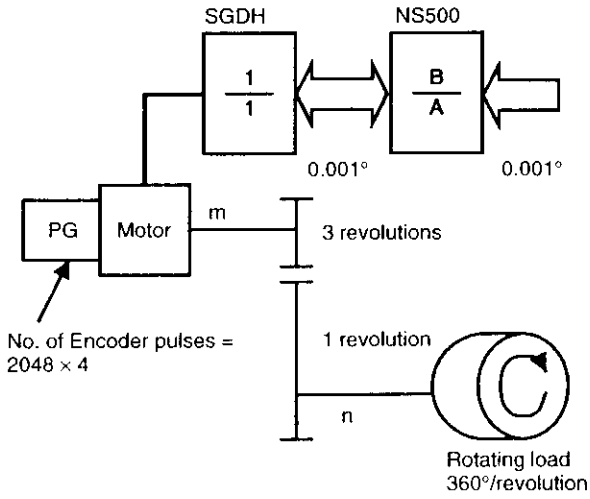
■ Electronic Gear Settings when Using a Rotary Table

If using a rotary table, first check the following specifications.

- Number of Encoder pulses
- Gear ratio

System Example

The following system example shows the formulas when the reference unit is set to 0.001°.



- REV = 360°/0.001° = 36000
- A = REV × {Gear Ratio (load rev.)} = 36000 × 1 = 36000
- B = (Encoder pulses) × (Pulse multiplier) × {Gear ratio (motor rev.)} = 2048 × 4 × 3 = 24576

Data ranges are shown below.

- A ≦ 10,000,000
- B ≦ 10,000,000
- 100 ≧ B/A ≧ 0.01

By storing the value of A in Pn811 and the value of B in Pn810, you can use the Electronic Gear function. These parameters are enabled when the power is turned ON. After you have changed the parameter, execute the Module Reset Command or the Reset Service to the Identity Object.

IMPORTANT

Setting B/A outside the range 0.01 to 100 may result in a misoperation. Make sure to set B and A within this range.

4.3.2 Zero Point Return Parameters

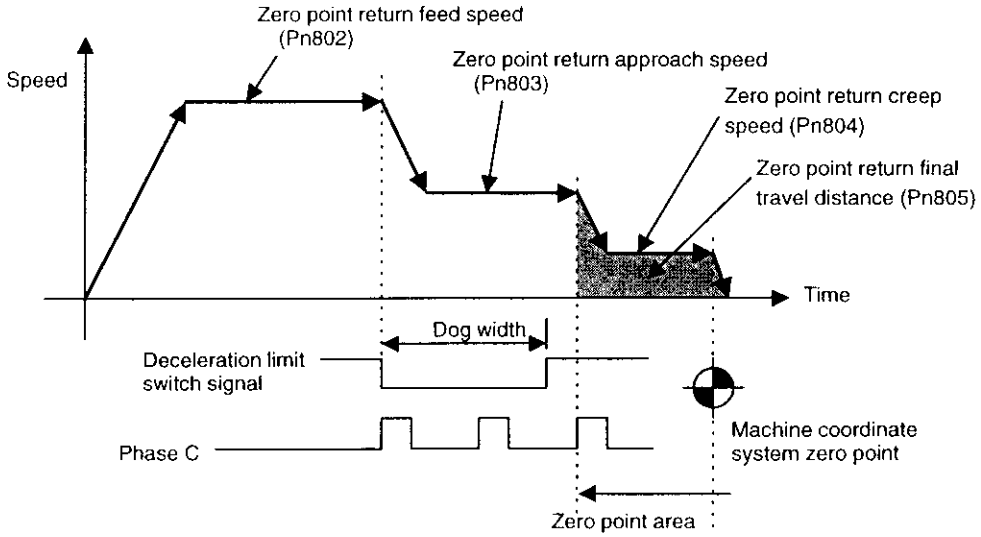
■ Zero Point Return Types

The following four types of zero point return are supported.

Type 0

This zero point return type returns to the zero point using the deceleration limit switch signal (DEC signal) and the phase C pulse of the encoder. The outline of the operation is as follows:

1. The axis travels in the direction specified as the zero point direction in the Zero Point Return Function Selection (Pn801) at the Zero Point Return Feed Speed (Pn802).
2. When the deceleration limit switch status changes, the axis decelerates and travels at the Zero Point Return Approach Speed (Pn803).
3. When the deceleration limit switch status changes again, the axis decelerates further when the first encoder phase C pulse is detected and then travels at the Zero Point Return Creep Speed (Pn804).
4. The axis travels the Zero Point Return Final Travel Distance (Pn805) from the position where the phase C was detected, and that position becomes the zero point.

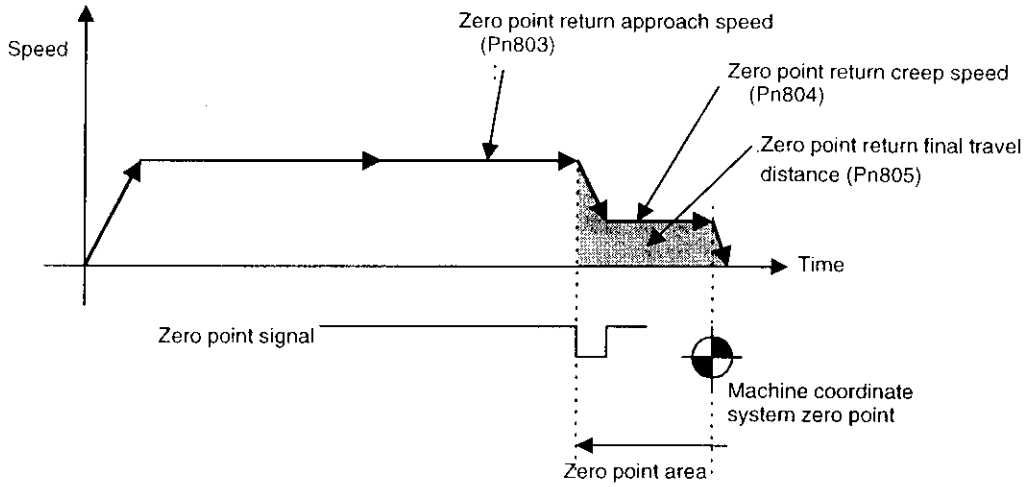


Type 1

This zero point return type returns to the zero point using the zero point signal (ZERO signal). The outline of the operation is as follows:

1. The axis travels in the direction specified as the zero point direction in the Zero Point Return Function Selection (Pn801) at the Zero Point Return Approach Speed (Pn803).
2. When the zero point signal status changes, the axis decelerates, and travels at the Zero Point Return Creep Speed (Pn804).

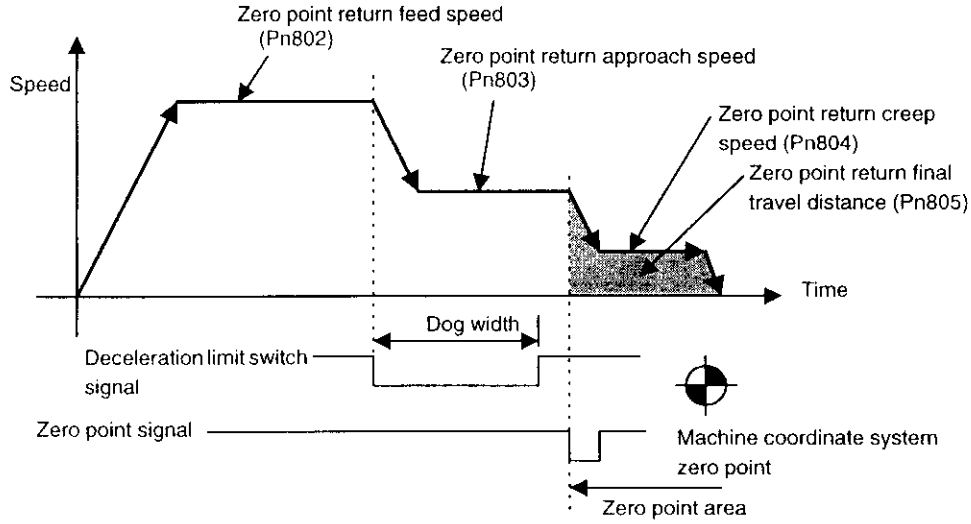
3. The axis travels the Zero Point Return Final Travel Distance (Pn805) from the position that the zero point signal status changed, and that position becomes the zero point.


Speed
Zero point return approach speed (Pn803)
Zero point return creep speed (Pn804)
Zero point return final travel distance (Pn805)
Time
Zero point signal
Machine coordinate system zero point
Zero point area

Type 2

This zero point return type returns to the zero point using the deceleration limit switch (DEC signal) and the zero point signal (ZERO signal). The outline of the operation is as follows:

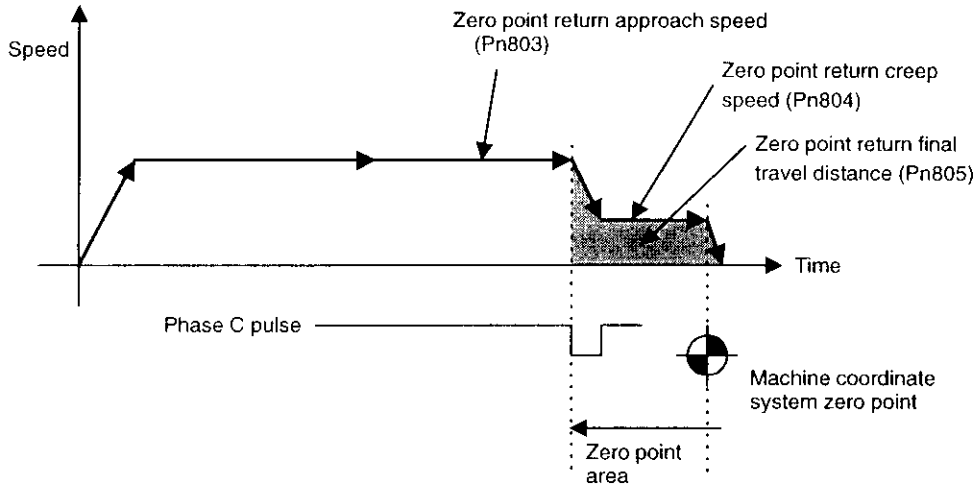
1. The axis travels in the direction specified as zero point direction in the Zero Point Return Function Selection (Pn801) at the Zero Point Return Feed Speed (Pn802).
2. When the deceleration limit switch status changes, the axis decelerates, and travels at the Zero Point Return Approach Speed (Pn803).
3. When the zero point signal changes, the axis decelerates further and travels at the Zero Point Return Creep Speed (Pn804).
4. The axis travels the Zero Point Return Final Travel Distance (Pn805) from the position where the zero point signal changed, and that position becomes the zero point.


Zero point return feed speed (Pn802)
Zero point return approach speed (Pn803)
Speed
Zero point return creep speed (Pn804)
Zero point return final travel distance (Pn805)
Time
Dog width
Deceleration limit switch signal
Zero point signal
Machine coordinate system zero point
Zero point area

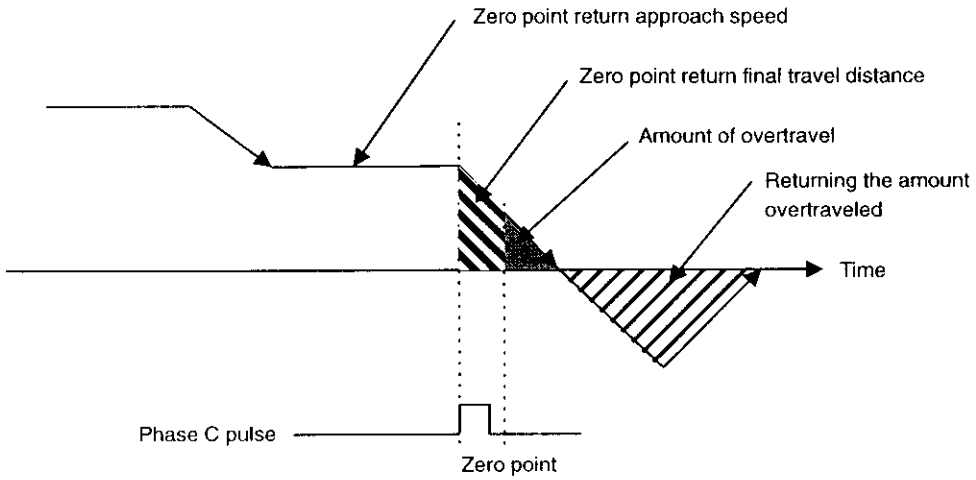
Type 3

This zero point return type returns to the zero point using the phase C pulse of the encoder only. The outline of the operation is as follows:

1. The axis travels in the direction specified as zero point direction in the Zero Point Return Function Selection (Pn801) at the Zero Point Return Approach Speed (Pn803).
2. When the first phase C pulse of the encoder is detected, the axis decelerates, and travels at the Zero Point Return Creep Speed (Pn804).
3. The axis travels the Zero Point Return Final Travel Distance (Pn805) from the position where the phase C pulse was detected, and that position becomes the zero point.


Speed
Zero point return approach speed (Pn803)
Zero point return creep speed (Pn804)
Zero point return final travel distance (Pn805)
Time
Phase C pulse
Machine coordinate system zero point
Zero point area

INFO When the setting for the Zero Point Return Final Travel Distance (Pn805) is small (when the distance is shorter than the distance required for the deceleration from approach speed), the axis will travel past the zero point and then return to it from the other direction.



■ Parameter Details (Object 0x64)

The details of parameters relating to zero point return are shown below.

Zero Point Return Mode (Pn800)

The zero point return type is specified in the zero point return mode.

Zero Point Return Mode	Zero Point Return Type
0	3-step deceleration using deceleration limit switch and phase C pulse
1	Double-step deceleration using zero point signal
2	3-step deceleration using deceleration limit switch and zero point signal
3	Double-step deceleration using phase C pulse

Zero Point Return Function Selection (Pn801)

The zero point return function selection has the following bit settings.

Bit	Name	Description
0	Zero Point Return Direction Setting*	0: Positive direction 1: Negative direction
1	Deceleration Limit Switch Signal Setting	0: Enabled on Low 1: Enabled on High
2	Zero Point Signal Setting	0: Enabled on leading edge 1: Enabled on trailing edge
3 to 15	Reserved	–

Zero Point Return Feed Speed (Pn802)

Use the Zero Point Return Feed Speed to set the initial feed speed for 3-step deceleration zero point return.

The setting unit is 1,000 steps/min.

Zero Point Return Approach Speed (Pn803)

Use the Zero Point Return Approach Speed to set the approach speed for zero point return. The setting unit is 1,000 steps/min.

Zero Point Return Creep Speed (Pn804)

Use the Zero Point Return Creep Speed to set the creep speed for zero point return. The setting unit is 1,000 steps/min.

Zero Point Return Final Travel Distance (Pn805)

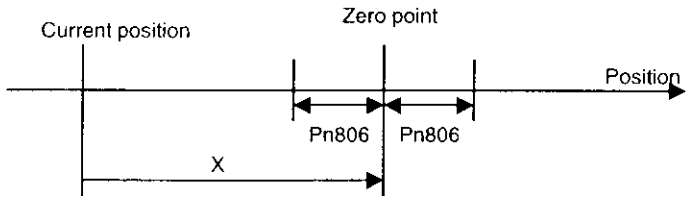
Use the Zero Point Return Final Travel Distance to set the distance from the position where the encoder phase C and zero point signal were detected to the machine zero point. The setting unit is steps.

Zero Point Output Width (Pn806)

Use the Zero Point Output Width to set the area that will be regarded as the zero point. The setting unit is steps.

In the following diagram, if the conditions outlined below are met, the Zero Point Flag in the response data will be set to 1.

- X = | Zero point – Current position | ≦ Pn806



Zero Point Offset (Pn809)

The system automatically writes to the Zero Point Offset the value of the offset from the zero point on the encoder when the zero point setting in the absolute value detection system has been completed. Normally, this parameter does not need to be set.

When using an absolute value detection system, set this value to enable adjustment of the zero point.

Zero Point Return Acceleration/Deceleration Time (Pn80A)

Use the Zero Point Return Acceleration/Deceleration Time to set the acceleration/declaration time constant used during zero point return. The setting unit is ms. Single-step linear acceleration/deceleration is used for zero point return. Refer to *4.3.4 Speed, Acceleration, and Deceleration* for information on this acceleration/deceleration type.

4.3.3 Machine System and Peripheral Devices

The details of parameters relating to the machine system and peripheral devices are shown below.

Coordinate Type (Pn812)

Use the Coordinate Type to set whether to use the NS500 Unit as a linear axis or rotary axis.

Pn812	Description
0	The linear axis is designated. The unit of current value data: steps
1	The rotary axis is designated. The unit of current value data: degrees

Reference Units per Machine Rotation (Pn813)

Use the Reference Units per Machine Rotation to set the reference unit for one machine rotation. This parameter is enabled only when the coordinate type is set to rotary axis. If this parameter is not set correctly, when the machine performs a 360° rotation, the current position will not be reset to 0°, so be careful.

The setting unit is steps. The initial value is 360,000.

Backlash Compensation (Pn814)

Use the Backlash Compensation to set the amount of compensation when backlash compensation is used. The setting unit is steps.

Backlash Compensation Direction (Pn815)

Use the Backlash Compensation Direction to set the direction of the backlash compensation.

Normally, set this parameter in the opposite direction to the zero point direction.

Pn815	Description
0	Positive Direction
1	Negative Direction

Positive Software Limit (Pn816)

Use the Positive Software Limit to set the software limit in the positive direction. The setting unit is reference unit. Make the setting between –99,999,999 and 99,999,999.

Negative Software Limit (Pn817)

Use the Negative Software Limit to set the software limit in the negative direction. The setting unit is reference unit. Make the setting between –99,999,999 and 99,999,999.

Machine Function Selection (Pn818)

Use the Machine Function Selection to set whether or not to use the software limit functions and the backlash compensation functions.

Bit	Description
0	0: Software Limit is disabled. 1: Software Limit is enabled.
1	0: Backlash Compensation is disabled. 1: Backlash Compensation is enabled.

Hardware Limit Signal Function Selection (Pn819)

Use the Hardware Limit Signal Function Selection to set whether or not to use the hardware limit and to set the signal polarity.

Bit	Name	Description
0	Enable/Disable Hardware LImit	0: Enabled 1: Disabled
1	Hardware Limit Signal Polarity	0: Enabled on Low 1: Enabled on High
2 to 15	Reserved	–

Hardware Limit Action (Pn81A)

Use the Hardware Limit Action to set the operation of the NS500 Unit when a hardware limit is detected.

Pn81A	Description
0	Servo OFF
1	Hard Stop: Stops at the specified maximum torque.
2	Deceleration to a Stop: Stops according to the specified deceleration curve.
3 to 255	Reserved

Emergency Stop Signal Function Selection (Pn81B)

Use the Emergency Stop Signal Function Selection to set whether or not to use the emergency stop function and to set the polarity of the signal.

Bit	Name	Description
0	Enable/disable Emergency Stop	0: Disabled 1: Enabled
1	Emergency Stop Signal Polarity	0: Disabled on Low 1: Enabled on High
2 to 15	Reserved	–

4.3.4 Speed, Acceleration, and Deceleration

■ Acceleration and Deceleration Patterns

The following acceleration and deceleration patterns are possible by combining acceleration/deceleration types (Pn826 or Pn836) and filters (Pn829).

		Acceleration/Deceleration Type (Pn826 or Pn836)			
		0: None	1: Single-step Linear	2: Double-step Linear	3: Asymmetric
Filter Selection (Pn829)	0: None	No acceleration and deceleration	Single-step Linear Accel/Decel Constant Accel/Decel*1	Double-step Linear Accel/Decel Constant Accel/Decel*1	Asymmetric Linear Accel/Decel Constant Accel/Decel*1
	1: Exponent	Exponential Accel/Decel Constant Accel/Decel time*2	---	---	---
	2: Exponent with Bias	Exponential Accel/Decel with Bias Constant Accel/Decel time*2	---	---	---
	3: Travelling Average	Single-step Linear Accel/Decel Constant Accel/Decel time*2	S-curve Accel/Decel Time Constant Accel/Decel*1	---	Asymmetric S-curve Accel/Decel Constant Accel/Decel*1

* 1. With Constant Accel/Decel, the time required for acceleration and deceleration changes with the feed speed changes.

* 2. With Constant Accel/Decel time, the time required for acceleration and deceleration does not change even if the feed speed changes.

Note: Combinations other than those given above may result in incorrect acceleration and deceleration.

Single-step Linear Acceleration/Deceleration with Constant Acceleration/Deceleration

Table 4.4 Related Parameters

Pn□□□	Name
Pn826	Acceleration/Deceleration Type for Positioning (= 1)
Pn829	Filter Selection (= 0)
Pn821	Feed Speed for Positioning
Pn822	Acceleration Time for Positioning
Pn843	Maximum Feed Speed

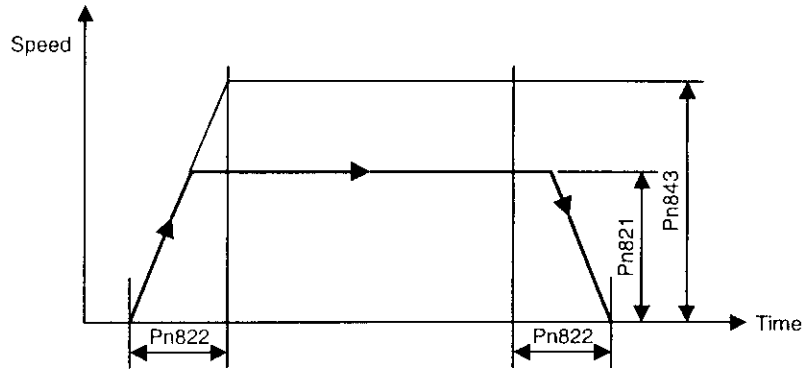


Figure 4.1 Single-step Linear Acceleration/Deceleration with Constant Acceleration/Deceleration

Double-step Linear Acceleration/Deceleration with Constant Acceleration/Deceleration

Table 4.5 Related Parameters

Pn□□□	Name
Pn826	Acceleration/Deceleration Type for Positioning (= 2)
Pn829	Filter Selection (= 0)
Pn821	Feed Speed for Positioning
Pn822	Acceleration Time Constant for Positioning
Pn824	Switch Speed for Second Accel/Decel
Pn825	Accel/Decel Time Constant of Second Accel/Decel
Pn843	Maximum Feed Speed

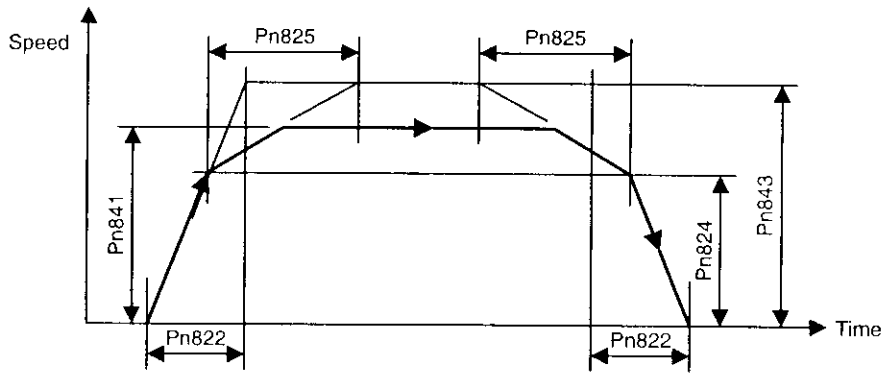


Figure 4.2 Double-step Linear Acceleration/Deceleration with Constant Acceleration/Deceleration

Asymmetric Linear Acceleration/Deceleration with Constant Acceleration/Deceleration

Table 4.6 Related Parameters

Pn□□□	Name
Pn826	Acceleration/Deceleration Type for Positioning (= 3)
Pn829	Filter Selection (= 0)
Pn821	Feed Speed for Positioning
Pn822	Acceleration Time for Positioning
Pn823	Deceleration Time for Positioning
Pn843	Maximum Feed Speed

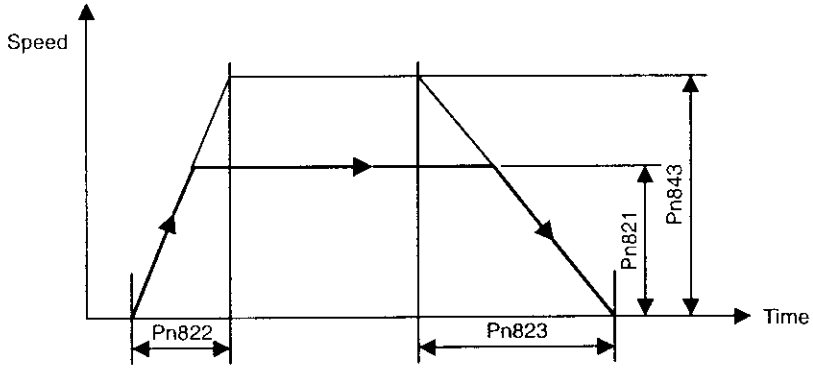


Figure 4.3 Asymmetric Linear Acceleration/Deceleration with Constant Acceleration/Deceleration

Exponential Acceleration/Deceleration with Constant Acceleration/Deceleration Time

Table 4.7 Related Parameters

Pn□□□	Name
Pn826	Acceleration/Deceleration Type for Positioning (= 0)
Pn829	Filter Selection (= 1)
Pn821	Feed Speed for Positioning
Pn840	Time Constant for Exponential Acceleration/Deceleration

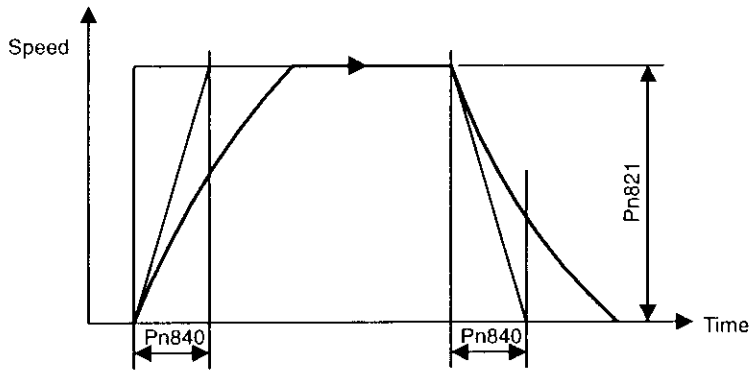


Figure 4.4 Exponential Acceleration/Deceleration with Constant Acceleration/Deceleration Time

Exponential Acceleration/Deceleration with Bias with Constant Acceleration/Deceleration Time

Table 4.8 Related Parameters

Pn□□□	Name
Pn826	Acceleration/Deceleration Type for Positioning (= 0)
Pn829	Filter Selection (= 2)
Pn821	Feed Speed for Positioning
Pn840	Time Constant for Exponential Acceleration/Deceleration
Pn841	Bias Speed for Exponential Acceleration/Deceleration

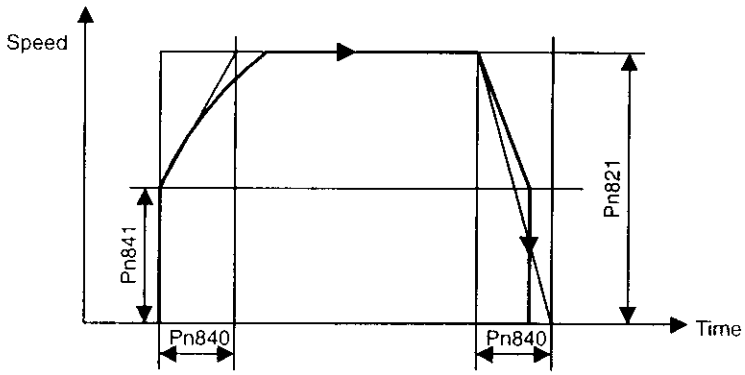


Figure 4.5 Exponential Acceleration/Deceleration with Bias with Constant Acceleration/Deceleration Time

Single-step Linear Acceleration/Deceleration with Constant Acceleration/Deceleration Time

Table 4.9 Related Parameters

Pn□□□	Name
Pn826	Acceleration/Deceleration Type for Positioning (= 0)
Pn829	Filter Selection (= 3)
Pn821	Feed Speed for Positioning
Pn842	Time Constant of Travelling Average

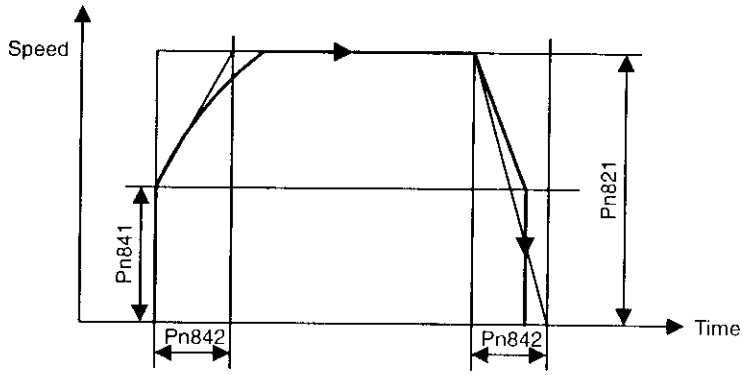


Figure 4.6 Single-step Linear Acceleration/Deceleration with Constant Acceleration/Deceleration Time

S-curve Acceleration/Deceleration with Constant Acceleration/Deceleration

Table 4.10 Related Parameters

Pn□□□	Name
Pn826	Acceleration/Deceleration Type for Positioning (= 1)
Pn829	Filter Selection (= 3)
Pn821	Feed Speed for Positioning
Pn822	Acceleration Time for Positioning
Pn842	Time Constant of Travelling Average
Pn843	Maximum Feed Speed

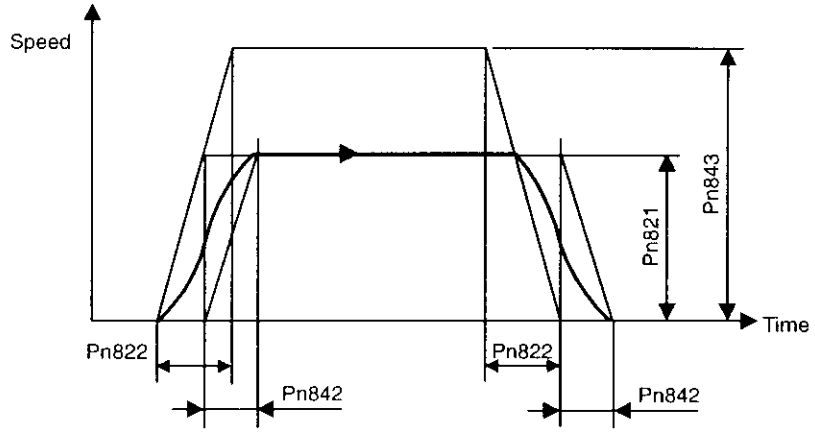


Figure 4.7 S-curve Acceleration/Deceleration with Constant Acceleration/Deceleration

Asymmetric S-curve Acceleration/Deceleration with Constant Acceleration/Deceleration

Table 4.11 Related Parameters

Pn□□□	Name
Pn826	Acceleration/Deceleration Type for Positioning
Pn829	Filter Selection
Pn821	Feed Speed for Positioning (mm/min)
Pn822	Acceleration Time for Positioning
Pn823	Deceleration Time for Positioning
Pn842	Time Constant for Travelling Average
Pn843	Maximum Feed Speed

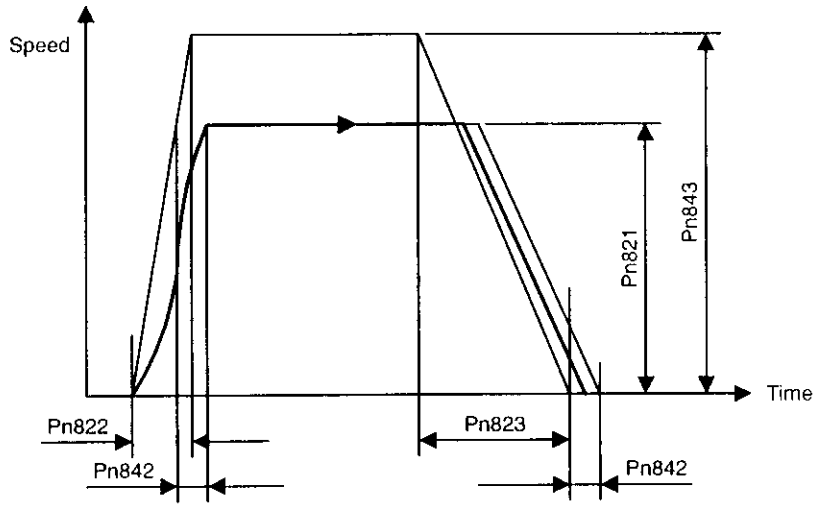


Figure 4.8 Asymmetric S-curve Acceleration/Deceleration with Constant Acceleration/Deceleration

■ Parameter Details

Feed Speed for Positioning (Pn821)

Use the Feed Speed for Positioning to set the feed speed of the positioning. The setting unit is 1,000 steps/min.

Acceleration Time for Positioning (Pn822)

Use the Acceleration Time for Positioning to set the acceleration time for the positioning. The setting unit is ms.

Deceleration Time for Positioning (Pn823)

Use the Deceleration Time for Positioning to set the deceleration time for positioning. The setting unit is ms.

This parameter is enabled only when the Acceleration/Deceleration Type for Positioning (Pn826) is set to the asymmetrical linear acceleration and deceleration.

Switch Speed for Second Acceleration/Deceleration for Positioning (Pn824)

Use the Switch Speed for Second Acceleration/Deceleration for Positioning to set the switching speed to acceleration and deceleration of the second step when using double-step linear acceleration and deceleration. The setting unit is 1,000 step/min.

This parameter is enabled only when the Acceleration/Deceleration Type for Positioning (Pn826) is set to double-step linear acceleration and deceleration.

Acceleration/Deceleration Time for Second Acceleration/Deceleration for Positioning (Pn825)

Use the Acceleration/Deceleration Time for Second Acceleration/Deceleration for Positioning to set the acceleration and deceleration time for the second step when using double-step linear acceleration and deceleration. The setting unit is ms.

This parameter is enabled only when the Acceleration/Deceleration Type for Positioning (Pn826) is set to double-step linear acceleration and deceleration.

Acceleration/Deceleration Type for Positioning (Pn826)

Use the Acceleration/Deceleration Type for Positioning to set the type of acceleration and deceleration for the positioning.

You can set eight different acceleration and deceleration patterns using different combinations of Acceleration/Deceleration Type for Positioning and Filter Selection (Pn829).

Setting	Description
0	None
1	Single Step Linear

Setting	Description
2	Double Step Linear
3	Asymmetric

External Positioning Feed Speed (Pn827)

Use the External Positioning Feed Speed to set the feed speed for external positioning.

The setting unit is 1,000 steps/min.

Filter Selection (Pn829)

Use the Filter Selection to set the acceleration and deceleration filter type. This parameter is used in common by the positioning, constant feeding, and zero point return operations.

Setting	Description
0	None
1	Exponential
2	Exponential with Bias
3	Travelling Average

Constant Feed Reference Unit Selection (Pn830)

Use the Constant Feed Reference Unit Selection to set the reference unit for the speed setting for a constant feed command data.

Setting	Description
0	Sets an override value (%) for the feed speed for FEED (Pn831) in the command data.
1	Speed set directly in the command data. The setting unit is 1000 steps/min.

Constant Feed Speed (Pn831)

Use the Constant Feed Speed to set the feed speed when using the FEED operation. The setting unit is 1,000 steps/min.

Acceleration Time for Constant Feed (Pn832)

Use the Acceleration Time for Constant Feed to set the acceleration time when using the feed operation. The setting unit is ms.

Deceleration Time for Constant Feed (Pn833)

Use the Deceleration Time for Constant Feed to set the deceleration time when using asymmetrical acceleration and deceleration with the constant feed operation. The setting unit is ms.

This parameter is enabled only when the Acceleration/Deceleration Type for Constant Feed (Pn836) is set to asymmetrical linear acceleration and deceleration.

Switch Speed for Constant Feed Second Accel/Decel (Pn834)

Use the Switch Speed for Constant Feed Second Acceleration/Deceleration to set the switching speed to double-step acceleration and deceleration when using double-step linear acceleration and deceleration with the constant feed operation. The setting unit is 1,000 steps/min.

This parameter is enabled only when the Acceleration/Deceleration Type for Constant Feed (Pn836) is set to double-step linear acceleration and deceleration.

Accel/Decel Time for Constant Feed Second Accel/Decel (Pn835)

Use the Acceleration/Deceleration Time for Constant Feed Second Acceleration/Deceleration to set the second acceleration/deceleration time when using double-step linear acceleration and deceleration with the constant feed operation. The setting unit is ms.

This parameter is enabled only when the Acceleration/Deceleration Type for Constant Feed (Pn836) is set to double-step linear acceleration and deceleration.

Acceleration/Deceleration Type for Constant Feed (Pn836)

Use the Acceleration/Deceleration Type for Constant Feed to set the acceleration and deceleration type with the constant feed operation.

You can set eight different acceleration and deceleration patterns using different combinations of Acceleration/Deceleration Type for Constant Feed and Filter Selection (Pn829).

Setting	Description
0	None
1	Single Step Linear
2	Double Step Linear
3	Asymmetric

Time Constant for Exponential Acceleration/Deceleration (Pn840)

Use the Time Constant for Exponential Acceleration/Deceleration to set the time constant when using exponential acceleration and deceleration. This parameter is used in common by the positioning and the continuous rotary operation. The setting unit is ms.

Bias Speed for Exponential Acceleration/Deceleration (Pn841)

Use the Bias Speed for Exponential Acceleration/Deceleration to set the bias speed of the exponential acceleration and deceleration. The setting unit is 1,000 steps/min.

Time Constant of Travelling Average (Pn842)

Use the Time Constant of Travelling Average to set the time constant of the average travel speed of the acceleration and deceleration. This parameter is used in common by the positioning and the continuous rotary operation. The setting unit is ms.

Maximum Feed Speed (Pn843)

Use the Maximum Feed Speed to set the maximum feed speed of the positioning, FEED, and zero point return operations. The acceleration and deceleration data is calculated from this data and the time constants. The setting unit is 1,000 steps/min.

Step Distance 1 (Pn844)

Use the Step Distance 1 to set the amount of travel when executing step operation. This value is used when the 0 has been specified as the command data in a command data.

The setting unit is steps.

Step Distance 2 (Pn845)

Use the Step Distance 2 to set the amount of travel when executing step operation. This value is used when the 1 has been specified as the command data in a command data.

The setting unit is steps.

Step Distance 3 (Pn846)

Use the Step Distance 3 to set the amount of travel when executing step operation. This value is used when the 2 has been specified as the command data in a command data.

The setting unit is steps.

Step Distance 4 (Pn847)

Use the Step Distance 4 to set the amount of travel when executing step operation. This value is used when the 3 has been specified as the command data in a command data.

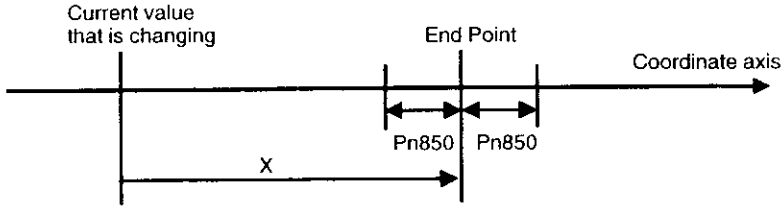
The setting unit is steps.

4.3.5 Positioning Parameters

■ Parameter Details

Positioning Deadband (Pn850)

Use the Positioning Deadband to set the positioning completed range, i.e., to determine if the axis is on-target position. The setting unit is steps. When the positioning deadband is set to 0, no on-target position check will be performed.



Positioning Deadband

When the following condition is satisfied in the above figure, the axis is viewed as being at the on-target position and the On-target Flag in the response data will be set to 1.

- X = (End point – Current value) ≤ Pn850

Positioning Timeout (Pn851)

Use the Positioning Timeout to set the time for performing on-target position check. The setting unit is ms. If, after the move command distribution has been completed, the positioning completed range is not entered within the time set, A.9A positioning a completion timeout warning will be sent.

If this parameter is set to 0, the check time becomes infinite.

Positioning Proximity Detection Width (Pn852)

Use the Positioning Proximity Detection Width to set the range for positioning area proximity to be detected. If the difference between the current position and the target position are within this parameter range, the proximity signal in the response data will be set to 1. The setting unit is steps.

Direction for Rotation System (Pn853)

Use the Direction for Rotation System to set the rotation direction for when Station Commands or rotation commands using absolute values are used.

Setting	Description
0	Uses the rotation direction in command data.
1	Uses the direction for the shortest travel.

Approach Speed for External Positioning (Pn854)

Use the Approach Speed for External Positioning to set the approach speed after the external signal has reversed status for an external positioning command.

The setting unit is 1,000 steps/min.

Travel Distance for External Positioning (Pn855)

Use the Travel Distance for External Positioning to set the travel distance after the external signal has reversed status for an external positioning command.

The setting unit is steps.

Function Selection for External Positioning (Pn856)

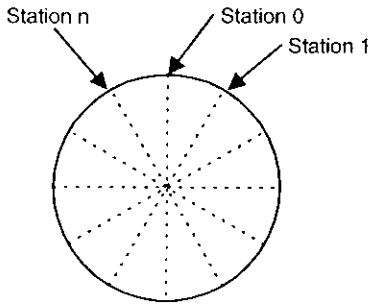
Use the Function Selection for External Positioning to select the polarity of the external signal.

Bit	Name	Description
0	External Signal Polarity	0: Enabled on low 1: Enabled on high
2 to 15	Reserved	–

Number of Stations (Pn85A)

Use the Number of Stations to set how many stations one revolution of the servomotor will be evenly split into when Station Commands are used.

In Station Commands, equally divided stations are numbered in order from 0 and positioning is performed by specifying a station number.

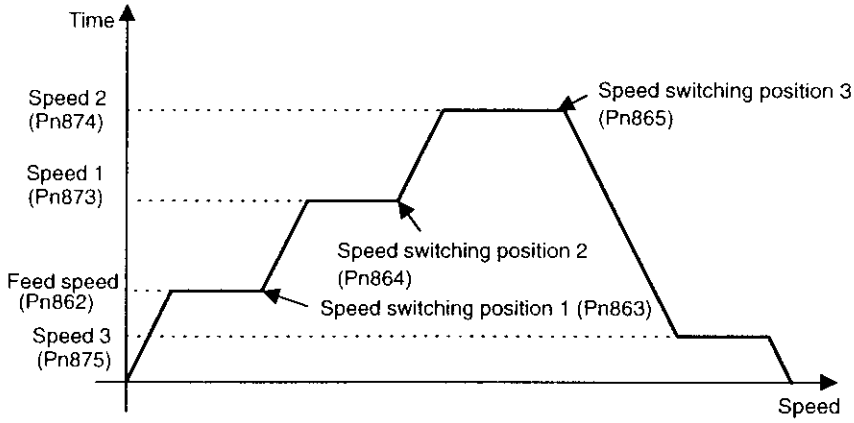


4.3.6 Multi-speed Positioning

By using multi-speed positioning, the speed can be changed in stages during positioning.

Up to 16 speed change stages are possible.

When the axis reaches a specified position, the speed switches to the speed for the next stage and the axis travels to the specified position in that next stage.



■ Parameter Details

Number of Points for Speed Switching (Pn861)

Use the Number of Points for Speed Switching to set the number of points at which the speed will be switched. If, for example, the parameters for speed switching positions were set from 1 to 16 but this setting for the number of points was set to 3, the speed switching would be enabled for 3 points only.

Initial Feed Speed for Multi-speed Positioning (Pn862)

Use the Initial Feed Speed for Multi-speed Positioning to set the initial feed speed when performing speed multi-step positioning. This speed will be enabled until the position in the speed switching position 1 parameter is reached.

The setting unit is 1,000 steps/min.

Speed Switching Positions 1 to 16 (Pn872)

Use the Speed Switching Position to set the position at which the speed is to change at a position relative to the start position. The speed switching position xx and switching speed xx are used together. For example, the axis will travel from speed switching position 1 to speed switching position 2 at speed 1.

The setting unit is steps.

Switching Speeds 1 to 16 (Pn873 to Pn882)

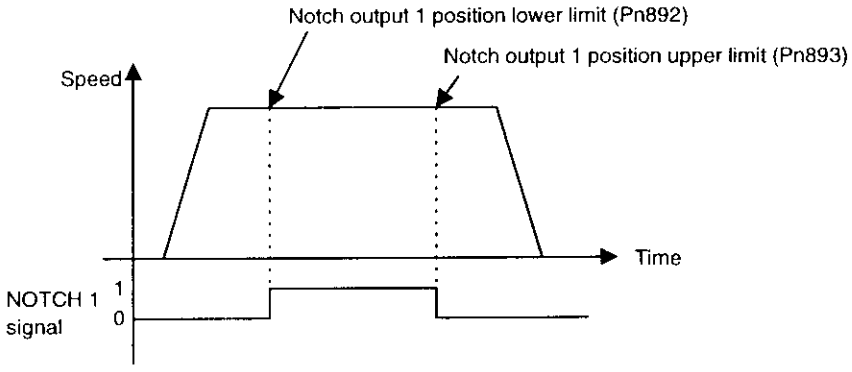
Use the Switching Speed to set the feed speed between specified speed switching positions. For example, the axis will travel at speed 2 between speed switching position 2 and speed switching position 3.

The setting unit is 1,000 steps/min.

4.3.7 Notch Signal Output Positioning

During the positioning, notch signals (NOTCH 1 and NOTCH 2) are output when specified points are passed.

Two notch signals, NOTCH 1 and NOTCH 2, can be output.



■ Parameter Details

Notch Signal Output Position Setting (Pn890)

Use the Notch Signal Output Position Setting to set whether absolute or relative positions are set for the notch signal output position parameters.

Setting	Description
0	Setting absolute position.
1	Specifies relative position.

Notch Signal Output Setting (Pn891)

Use the Notch Signal Output Setting to set the polarity of the notch signal output.

Table 4.12 Notch Signal Output Setting

Setting	Description
0	Sets NOTCH 1 signal.
1	Sets NOTCH 2 signal.

Table 4.13 Bit Meanings

Bit 0/ Bit 1	Description
0	Normally: OFF When passed: ON
1	Normally: ON When passed: OFF

Notch 1 Output Position Lower Limit (Pn892)
Notch 1 Output Position Upper Limit (Pn893)

Use the Notch 1 Output Position Upper/Lower Limits to set the output position range for notch signal (NOTCH 1). When the current position is inside this range, the status of the NOTCH 1 signal output is reversed based on the notch signal output setting.

Notch 2 Output Position Lower Limit (Pn894)
Notch 2 Output Position Upper Limit (Pn895)

Use the Notch 2 Output Position Upper/Lower Limits to set the output position range for notch signal (NOTCH 2). When the current position is inside this range, the status of the NOTCH 2 signal output is reversed based on the notch signal output setting.

5

PROFIBUS-DP Communications

This chapter explains about using PROFIBUS-DP communications to execute commands and editing parameters for an NS500 Unit.

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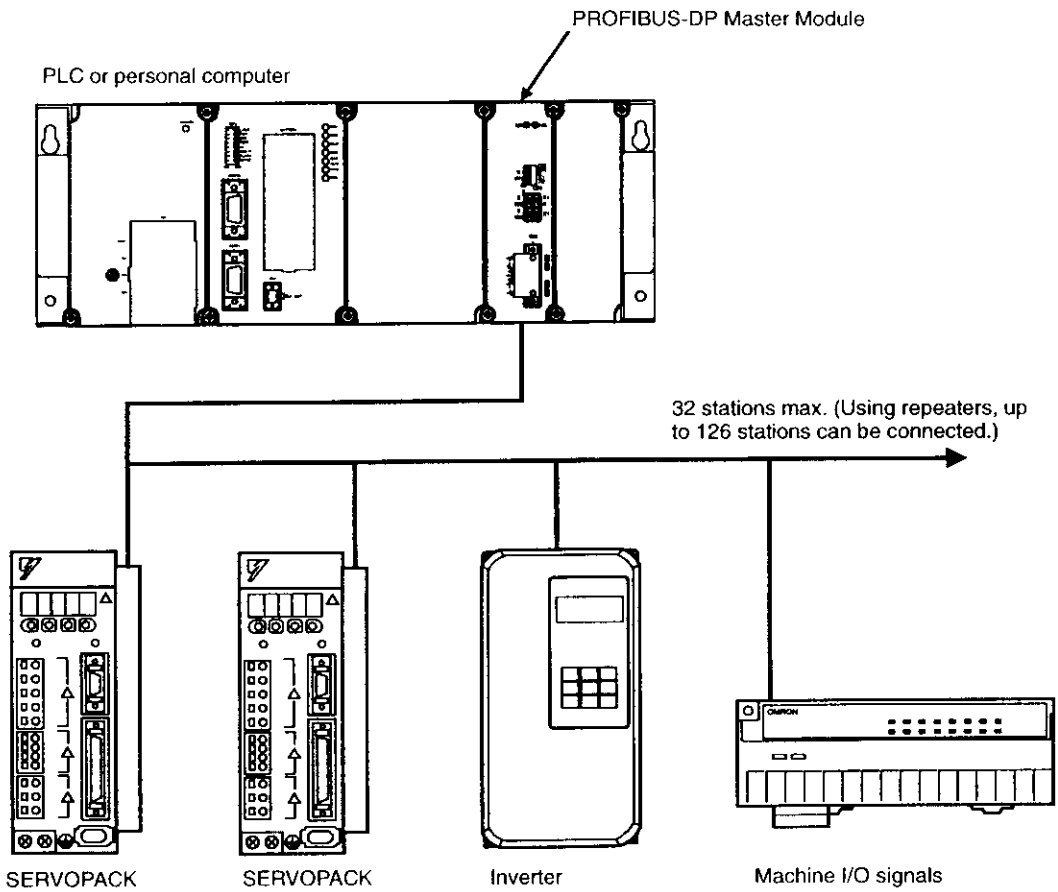
5.1 Specifications and Configuration

5.1.1 Specifications

The NS500 Unit is classified as a PROFIBUS-DP slave device, and can be controlled from different types of PROFIBUS-DP Master Module as a general-purpose I/O Module with 64 inputs and 64 outputs. Communications with the Master Module are cyclic; command datas are received cyclically from the Master Module and response datas are returned.

5.1.2 Control Configuration

An outline of the control configuration is shown below. A maximum of 32 NS500 Units or other slave devices can be connected to one PROFIBUS-DP Master. (The configuration can be expanded to include up to 126 stations using repeaters.)



5.2 PROFIBUS-DP Communications Setting Switches

This section explains the switch settings required for PROFIBUS-DP communications.

5.2.1 Rotary Switch Settings for Setting Station Address

Use the rotary switches (x1, x10) to set the PROFIBUS-DP station address. After making the settings, cycle the communications power to enable the settings.

The station address can be set between 0 and 125. If you make a setting outside this range, a setting error will occur.

Select the station address of the NS500 Unit using the switch settings as shown in the following table.

× 10	× 1	Station Address Decimal in ( )	× 10	× 1	Station Address Decimal in ( )	× 10	× 1	Station Address Decimal in ( )
0	0	0	2	A	2A (42)	5	4	54 (84)
	1	1		B	2B (43)		5	55 (85)
	2	2		C	2C (44)		6	56 (86)
	3	3		D	2D (45)		7	57 (87)
	4	4		E	2E (46)		8	58 (88)
	5	5		F	2F (47)		9	59 (89)
	6	6	3	0	30 (48)		A	5A (90)
	7	7		1	31 (49)		B	5B (91)
	8	8		2	32 (50)		C	5C (92)
	9	9		3	33 (51)		D	5D (93)
	A	A (10)		4	34 (52)		E	5E (94)
	B	B (11)		5	35 (53)		F	5F (95)
	C	C (12)		6	36 (54)	6	0	60 (96)
	D	D (13)		7	37 (55)		1	61 (97)
	E	E (14)		8	38 (56)		2	62 (98)
	F	F (15)		9	39 (57)		3	63 (99)
1	0	10 (16)		A	3A (58)		4	64 (100)
	1	11 (17)		B	3B (59)		5	65 (101)
	2	12 (18)		C	3C (60)		6	66 (102)
	3	13 (19)		D	3D (61)		7	67 (103)
	4	14 (20)		E	3E (62)		8	68 (104)
	5	15 (21)		F	3F (63)		9	69 (105)
	6	16 (22)	4	0	40 (64)		A	6A (106)
	7	17 (23)		1	41 (65)		B	6B (107)
	8	18 (24)		2	42 (66)		C	6C (108)
	9	19 (25)		3	43 (67)		D	6D (109)
	A	1A (26)		4	44 (68)		E	6E (110)
	B	1B (27)		5	45 (69)		F	6F (111)
	C	1C (28)		6	46 (70)	7	0	70 (112)
	D	1D (29)		7	47 (71)		1	71 (113)
	E	1E (30)		8	48 (72)		2	72 (114)
	F	1F (31)		9	49 (73)		3	73 (115)
2	0	20 (32)		A	4A (74)		4	74 (116)
	1	21 (33)		B	4B (75)		5	75 (117)
	2	22 (34)		C	4C (76)		6	76 (118)
	3	23 (35)		D	4D (77)		7	77 (119)
	4	24 (36)		E	4E (78)		8	78 (120)
	5	25 (37)		F	4F (79)		9	79 (121)
	6	26 (38)	5	0	50 (80)		A	7A (122)
	7	27 (39)		1	51 (81)		B	7B (123)
	8	28 (40)		2	52 (82)		C	7C (124)
	9	29 (41)		3	53 (83)		D	7D (125)
							E	7E (126)

Note: Setting a value of 7F or more will result in an error (A.E8). The setting 7E (126) is used by the manufacturer for setup purposes. Set station addresses in the range 0 to 125.

5.2.2 LED Indicators

NS500 Units are equipped with two LED indicators, the Module Error indicator (ERR) to indicate the Unit status, and the Communications Status indicator (COMM) to indicate the PROFIBUS-DP communications status.

■ Module Error Indicator (ERR)

The Module Error indicator is a red LED that lights when a communications error occurs. It turns OFF while communications data is being exchanged (i.e., during normal operation). It lights at other times. The current status of the NS500 Unit is indicated, together with the Communications Status indicator (COMM), in the way shown in the table below.

■ Communications Status Indicator (COMM)

The Communications Status indicator is a red and green dual-display LED and indicates PROFIBUS-DP communications errors. The current status of the NS500 Unit is indicated, together with the Module Error indicator (ERR), in the way shown in the table below.

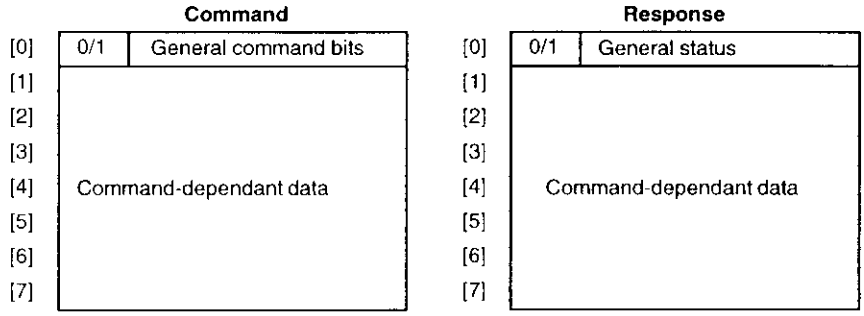
Indicator		Status	Cause
ERR	COMM		
ON	Lights red and green alternately.	• Performing self diagnosis • Invalid station address setting	• The NS500 Unit performs self diagnosis for approx. 2 seconds after power is turned ON. • A station address is set to 7F (127) or more.
	Flashes green slowly (flashing cycle: approx. 0.5 Hz).	Waiting for a parameter message from the Master	• At startup, the Master has not yet sent a parameter message. • The NS500 Unit is waiting for a parameter message sent from the Master.
	Flashes green (flashing cycle: 3 Hz).	Waiting for a configuration message from the Master	The NS500 Unit has received a valid parameter message and is waiting for a configuration message. • Normal start sequence: The NS500 Unit is in an extremely short intermediate state. • Error status: A parameter message was received from the Master, but a configuration message has not been received.
OFF	Lights green.	Exchanging data	Data is being exchanged between the Master and the Slave (normal operation).
ON	Flashes red slowly (flashing cycle: approx. 0.5 Hz).	Communications not established	The NS500 Unit has not detected the baud rate. • The communications cable is not connected properly, or is defective. • The Master changed the baud rate. • The Master's power supply has dropped.
	Flashes red (flashing cycle: 3 Hz).	PROFIBUS-DP watchdog timeout	• A message could not be received within the previously set bus communications time. (The status is held until a new parameter message is received.)
	Lights red.	NS500 Unit system error	• Error detected by self diagnosis. • The system is not operating at all.

5.3 Command/Response Format

This section explains command sent to an NS500 Unit from the Master and the response sent from the NS500 Unit.

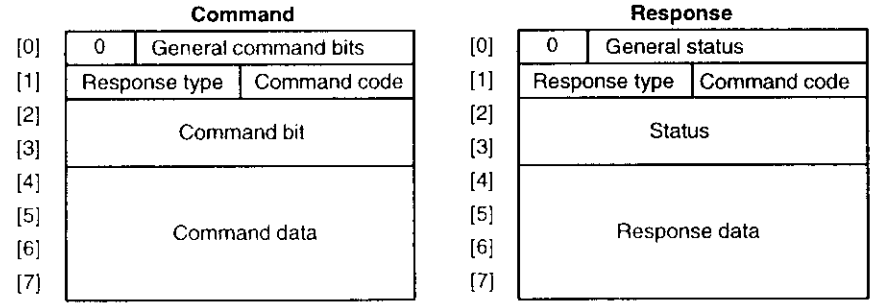
5.3.1 Command Format

This section explains the basic format of command sent to an NS500 Unit from the master device and the response sent from the NS500 Unit to the master device. Command and response are in an 8-byte data format.

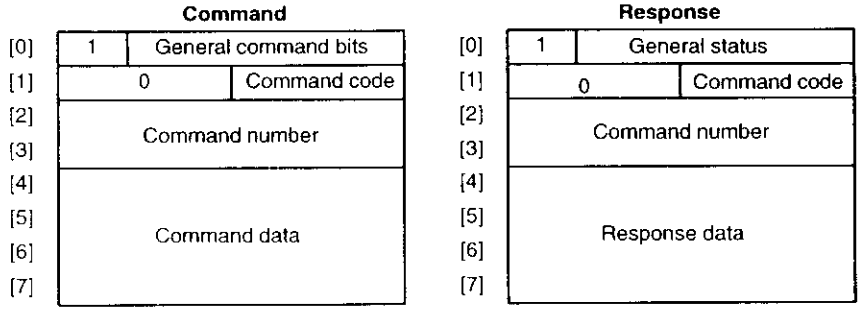


Both command and response are separated into two sections. Byte 0 is a general area and bytes 1 to 7 make up the command-dependant data area. The command-dependant data area can contain one of two types of commands, move commands and set/read commands. The type of command is defined by the most-significant bit (MSB) of byte 0.

■ Format for Move Commands



■ Format for Set/Read Commands



5.3.2 General Command Bits and Status

■ General Command Bits

The general command bit area is detailed below.

Table 5.1 General Command Bits

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	MOD	0	ALRST	ESTP	0	0	SVON	C_STRT

Mode: MOD

Use the MOD bit to specify the data format for bytes 1 to 7.

- 0: Move command format
- 1: Set/read command format

The MOD bit alters the data format for bytes 1 to 7. Set it carefully.

Alarm Reset Command: ALRST

Set the ALRST bit to 1 to reset the current alarm/warning. When an alarm or warning occurs in the NS500 Unit or SGDH, remove the cause of the alarm before setting this bit to 1. The alarm/warming will be cleared.

Always make sure this bit is set to 0 during normal operation and after an alarm has been cleared.

- 0: Normal operation
- 1: Alarm reset request

Emergency Stop Command: /ESTP

When the ESTP bit is changed from 1 to 0, a move command is canceled and the SGDH servo is turned OFF. If the axis is travelling, axis travel is stopped immediately and the SGDH servo is turned OFF as soon as the servomotor stops.

The ESTP Command has negative logic to confirm that PROFIBUS-DP communications have been established. Therefore, set the bit to 1 for normal operation and set it to 0 for emergency stops.

The emergency stop status will continue while this bit is set to 0. To release the emergency stop status, set the bit to 1. To turn ON the servo after releasing an emergency stop, set the Servo ON Command bit to 0 and then set it to 1.

- 0: Emergency stop request
- 1: Emergency stop release

Servo ON Command: SVON

Set the SVON bit to 1 to turn ON the SGDH servo. When the leading edge of the bit is detected, the SGDH servo is turned ON and remains ON while the command bit is set to 1. When the command bit setting changes to 0, the servo is turned OFF.

If an alarm turns OFF the SGDH servo, the command bit must be set to 0 and then set to 1 again.

- 0: Servo OFF request (request not to supply power to motor)
- 1: Servo ON request (request to supply power to motor)

Command Start Command: C_STRT

Set the C_STRT bit to 1 to start execution of the command specified by the command code. Always set the command code and command area data before (or at the same time as) setting the C_STRT bit to 1.

Refer to *5.3.3 Move command datas* and *5.3.4 Set/Read command datas* for details on using command codes.

- 0: Normal operation
- 1: Request to start command

■ General Status

Details on the general status area are shown below.

Table 5.2 General Status Bits

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	MOD_R	READY	PWRON	ESTP_R	ALRM	WARN	SVON_R	C_STRT_R

Mode: MOD_R

The MOD_R bit specifies the data format of bytes 1 to 7.

This bit will be the same as the mode given in the command data.

- 0: Response format for move commands
- 1: Response format for set/read commands

Module Ready: READY

The READY bit will be set to 1 when the NS500 Unit is ready to receive commands from the host device. The READY status will be 0 when the power is turned ON, and when the Module Reset Command in the command data has been received and the NS500 Unit is initializing.

- 0: Not ready to receive commands
- 1: Ready to receive commands

Main Power Supply Status: PWRON

The PWRON bit will be set to 1 when the SGDH main power supply is turned ON. If the main power supply is turned OFF, the bit will be 0 and the Servo ON and other commands cannot be executed.

- 0: Main power supply OFF
- 1: Main power supply ON

Emergency Stop: ESTP_R

The ESTP_R bit will be set to 0 when the Emergency Stop Command in the command data has been set to 0 and the NS500 Unit is in emergency stop status. Set the Emergency Stop Command in the command data to 1 to clear the emergency stop status, and this bit will change to 1.

This status has negative logic.

- 0: Emergency stop status
- 1: Not in emergency stop status

Alarm: ALRM

The ALRM bit will be set to 1 when the NS500 Unit has detected an alarm. When all alarms have been cleared by the Alarm Reset Command in the command data, this bit will change to 0.

- 0: Normal operation
- 1: Alarm has occurred

Warning: WARN

The WARN bit will be set to 1 when the NS500 Unit has detected a warning. When all warnings have been cleared by the Alarm Reset Command in the command data, this bit will change to 0.

When a warning has occurred, the command that generated the warning and commands other than data setting commands can still be executed normally.

- 0: Normal operation
- 1: Warning has occurred

Servo ON: SVON_R

The SVON_R bit will be set to 1 when the Servo ON Command in the command data is set to 1 and the SGDH servo is ON.

- 0: Servo OFF (power not supplied to motor)
- 1: Servo ON (power supplied to motor)

The SVON_R bit will be 0 in the following circumstances.

- When the Servo ON Command in the command data has been set to 0
- When the Emergency Stop Command has been set to 0
- When the Module Reset Command has been set to 1
- When an alarm has occurred

Command Start Response: C_STRT_R

The C_STRT_R bit will be set to 1 when the Command Start Command in the command data has been set to 1. The host device can recognize that the NS500 Unit has received a command from the host device by checking that this bit is 1.

- 0: C_STRT not received
- 1: C_STRT received

5.3.3 Move command data

■ command datas

Details on command datas for move commands are shown below.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	ALRST	/ESTP	0	0	SVON	C_STRT
1	Response type				Command code			
2	HOME	PTBL	STN	STEP	FEED	0	HOLD	CANCEL
3	0	0	0	0	0	0	DIR	INC
4	Command data							
5								
6								
7								

Command Codes

Command codes are used to specify positioning and other commands. To start execution of a command, set the command code and command data first (or at the same time), and then change the Command Start Command from 0 to 1.

Command Codes	Description
0000	No operation
0001	Simple positioning
0010	External positioning
0011	Positioning with notch signal outputs
0100	Multi-speed positioning

Response Types

The response type in the command data specifies the type of data that will be stored as the response data in the response data. The NS500 Unit creates response data in the response datas based on the specified response type.

Response Type	Response Data
0000	Command position (reference units)
0001	Current position (reference units)
0010	Position error (reference units)
0011	Command speed (1000 reference units/min)
0100	Current speed (1000 reference units/min)
0101	Torque (%)
1010	Station number
1011	Point table number

5

Cancel Command: CANCEL

If the Cancel Command is set to 1 during execution of a move command, the execution of the move command will be stopped and the servomotor will decelerate to a stop. The remaining travel distance will be canceled.

If command execution is completed, the following status will occur:

- INPOS = 1
- PRGS = 0

Confirm whether or not command execution has been completed by the status of these two flags.

- 0: Execution of move command possible
- 1: Request to cancel move command

Hold Command: HOLD

If the Hold Command is set to 1 during execution of a move command, the execution of the move command will be held and the servomotor will decelerate to a stop. The NS500 Unit will wait for command execution to be restarted. Set the Hold Command to 0 again to restart the execution of a move command.

If command execution is completed, the following status will occur:

- INPOS = 1
- PRGS = 0

Confirm whether or not command execution has been completed by the status of these two flags.

- 0: Execution of move command possible
- 1: Request to hold move command

Constant Feed Command: FEED

The NS500 Unit will start feeding at a constant speed when it detects the leading edge of the FEED bit. Constant feeding will continue while this bit is set to 1.

When the FEED bit is set to 0, the servomotor will decelerate to a stop. The direction for feeding is determined by the Movement Direction set in the command data area.

An override can be set for this command in the command data area. The override can be from 0% to 200% of the parameter speed or a specific speed can be set in the command data. Which method is used depends on Pn830 (Constant Feed Reference Unit Selection).

Settings Data Area	Description	
Movement direction	0: Forward 1: Reverse	
Command data	When Pn830 = 0	Set an override value (0 to 200). Set to 100 when not using the override function.
	When Pn830 = 1	Set the feed speed.

- 0: Feed operation stop
- 1: Feed operation request

Step Command: STEP

The NS500 Unit will start step operation when it detects the leading edge of the STEP bit. While the STEP bit is set to 1, the axis will travel only the distance set in the specified parameter. If the STEP bit is set to 0 during step operation, the servomotor will decelerate to a stop and the step operation will end. The remaining travel distance will be canceled.

The direction of movement for step operations is determined by the Movement Direction set in the command data area. The number of the step travel distance (0 to 3) is also set in the command data area. The parameter data set in Pn844 to Pn847 will be used for the step travel distance.

Settings Data Area	Description
Movement direction	0: Forward 1: Reverse
Command data	Set the selection number for step travel distance. 0: Uses Pn844 data. 1: Uses Pn845 data. 2: Uses Pn846 data. 3: Uses Pn847 data.

- 0: Step operation stop
- 1: Step operation request

Station Command: STN

The NS500 Unit will start station operation when it detects the leading edge of the STN bit. If this command is set to 0 while the axis is travelling, the servomotor will decelerate to a stop and the station operation will end. The remaining travel distance will be cancelled.

Settings Data Area	Description
Movement direction	0: Forward 1: Reverse
Absolute/incremental value	Specify whether the station number is an absolute value or incremental value.
Command data	Specify the target station number in bytes 7 and 6.

- 0: Station operation stop
- 1: Station operation request

Point Table Command: PTBL

The NS500 Unit will start point table operation when it detects the leading edge of the PTBL bit. If this command is set to 0 while the axis is travelling, the servomotor will decelerate to a stop and the point table operation will end. The remaining travel distance will be cancelled.

Settings Data Area	Description
Absolute/incremental value	Specify whether the position data in the point table is an absolute value or incremental value.
Command data	Specify the point table number to be used in bytes 7 and 6.

- 0: Stop point table positioning
- 1: Request for point table positioning

Zero Point Return Command: HOME

The NS500 Unit will start a zero point return when it detects the leading edge of the HOME bit. If this command is set to 0 while the axis is travelling, the servomotor will decelerate to a stop and the zero point return operation will end. The zero point return operation will not restart even if the HOME bit is set to 1 again.

The type of zero point return depends on the zero point return mode setting in Pn800.

- 0: Stop zero point return
- 1: Request for zero point return

Incremental Specification: INC

The INC bit specifies whether the data that indicates a position is used as an absolute value or an incremental value. Set this bit to 0 to specify an absolute position and to 1 to specify an incremental position.

This setting is used for the following commands.

- Station Command
- Point Table Command
- Positioning Command

The status of the INC bit cannot be changed during the execution of a move command.

- 0: Absolute value specified
- 1: Incremental value specified

Movement Direction: DIR

The DR bit specifies the movement direction. Set this bit to 0 for forward and to 1 for reverse operation.

This specification is used for the following commands.

- Feed Command
- Step Command
- Station Command

The movement direction specification is disabled during normal positioning. The status of the DIR bit cannot be changed during the execution of a move command.

- 0: Forward
- 1: Reverse

■ response datas

The response datas for move commands are shown below.

Table 5.3 Responses for Move Commands

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	READY	PWRON	/ESTP_R	ALRM	WARN	SVON_R	C_STRT_R
1	Response type				Command code			
2	HOME_R	PTBL_R	STN_R	STEP_R	FEED_R	0	HOLD_R	PRGS
3	POT	NOT	INPOS	NEAR	HOME_P	0	DIR_R	INC_R
4	command data							
5								
6								
7								

5

Progressing Flag: PRGS

The PRGS bit is set to 1 during the execution of a command. For move commands, this flag will be set to 1 while outputting to the SGDH.

When command execution has been completed or when a Cancel Command or other stop command has been received, the Progressing Flag is set to 0.

- 0: Command execution completed
- 1: During command execution

Holding Flag: HOLD_R

The HOLD_R bit is set to 1 when a Hold Command is received from the host device and for the duration of the hold.

The host device can confirm that the NS500 Unit correctly received the Hold Command by checking that the Holding Flag is set to 1.

- 0: Hold Command not received
- 1: Hold Command received

Constant Feed Flag: FEED_R

The FEED_R bit is set to 1 when a Constant Feed Command is received from the host device and while constant feeding is being executed. When the Constant Feed Command is set to 0, this flag is also set to 0. The host device can confirm that the NS500 Unit correctly received the Constant Feed Command by checking that the Feed Flag is set to 1.

This flag is set to 1 even if constant feeding cannot be executed because of a Servo OFF status, for example. The user must monitor for alarms during constant feeding for the Constant Feed Command.

The movement direction during constant feeding can be checked using the Movement Direction Flag: DIR_R.

- 0: Constant Feed Command not received
- 1: Constant Feed Command received

Step Flag: STEP_R

The STEP_R bit is set to 1 when a Step Command has been received from the host device and during step operation. This flag is set to 0 when the step operation has been completed normally or cancelled. The host device can confirm that the NS500 Unit correctly received the Step Command by checking that the Step Flag is set to 1.

This flag is set to 1 even if the step operation cannot be executed because of a Servo OFF status, for example. The user must monitor for alarms during step operation.

- 0: Step Command not received
- 1: Step Command received

Station Flag: STN_R

The STN_R bit is set to 1 when a Station Command has been received from the host device and during station operation. This flag is set to 0 when the station operation has been completed normally or cancelled. The host device can confirm that the NS500 Unit correctly received the Station Command by checking that the Station Flag is set to 1.

This flag is set to 1 even if the station operation cannot be executed because of a Servo OFF status, for example. The user must monitor for alarms during station operation.

- 0: Station Command not received
- 1: Station Command received

Point Table Flag: PTBL_R

The PTBL_R bit is set to 1 when a Point Table Command has been received from the host device and during point table operation. This flag is set to 0 when the point table operation has been completed normally or cancelled. The host device can confirm that the NS500 Unit correctly received the Point Table Command by checking that the Point Table Flag is set to 1.

This flag is set to 1 even if the point table operation cannot be executed because of a Servo OFF status, for example. The user must monitor for alarms during point table operation.

- 0: Point Table Command not received
- 1: Point Table Command received

Zero Point Return Flag: HOME_R

The HOME_R bit is set to 1 when a Zero Point Return Command has been received from the host device and during zero point return. This flag is set to 0 when the zero point return has been completed normally or cancelled. The host device can confirm that the NS500 Unit correctly received the Zero Point Return Command by checking that the Zero Point Return Flag is set to 1.

This flag is set to 1 even if the zero point return cannot be executed because of a Servo OFF status, for example. The user must monitor for alarms during zero point return.

- 0: Zero Point Return Command not received
- 1: Zero Point Return Command received

Incremental Specification Flag: INC_R

The INC_R bit receives and directly returns the status of the Incremental Specification in the command data. The host device can confirm by the change of status of this flag that the NS500 Unit has correctly received change in the incremental specification.

- 0: Absolute position specification received
- 1: Incremental position specification received

Movement Direction Flag: DIR_R

The DIR_R bit indicates the current command rotation direction for the servomotor. If the servomotor has stopped, this flag indicates the last command rotation direction. This flag is set to 0 to indicate forward, and to 1 to indicate reverse.

- 0: Forward
- 1: Reverse

Zero Point Flag: HOME_P

The HOME_P bit is set to 1 when the servomotor is within the zero point range. The zero point range is set in Pn806 (Zero Point Return Output Width).

When an incremental position detection system is used, this flag cannot be set to 1 for the period from when power is turned ON to the SGDH until the initial zero point return has been completed.

- 0: Outside zero point range
- 1: Within zero point range

Near Signal Flag: NEAR

The NEAR bit is set to 1 when the current position is within the On-target position range. When the current position is outside the On-target position range, the flag is set to 0. The On-target position range is set in Pn852 (Positioning Proximity Detection Width).

- 0: Outside On-target position range
- 1: Within On-target position range

In-position Flag: INPOS

The INPOS bit is set to 1 when the current position is within the positioning completed range of the target position. The flag is set to 0 when the current position is outside the positioning completed range. The On-target position range is set in Pn850 (Positioning Deadband).

- 0: Outside positioning completed range
- 1: Within positioning completed range

Negative Overtravel Flag: NOT

The NOT bit indicates the status of the negative overtravel signal for the external input connected to CN1 on the SGDH.

- 0: Negative overtravel signal OFF
- 1: Negative overtravel signal ON

Positive Overtravel Flag: POT

The POT bit indicates the status of the positive overtravel signal for the external input connected to CN1 on the SGDH.

- 0: Positive overtravel signal OFF
- 1: Positive overtravel signal ON

5.3.4 Set/Read command datas

■ command datas

Details on bytes 1 to 7 of the command datas for set/read commands (MOD = 1) are shown below.

The response type does not need to be specified for set/read commands.

Table 5.4 Set/Read Commands

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	0	ALRST	ESTP	0	0	SVON	C_STRT
1	0				Command code			
2	Command number							
3								
4	command data							
5								
6								
7								

Command Codes

A list of command codes is shown in the following table. Set "No operation" for commands that will not be executed.

The command codes in the response datas will basically be a copy of the command codes in the command datas. A warning for parameter setting error will be returned when the parameter number is different or the data is outside the setting range for the parameter.

Table 5.5 Command Codes

Command Code	Description
0000	No operation
1000	Read parameter
1001	Write parameter
1010	Set current position
1011	Set zero point
1100	Read alarm
1110	Reset Module

■ response datas

Details on bytes 1 to 7 of the response datas for set/read commands (MOD = 1) are shown below.

Table 5.6 Responses for Set/Read Commands

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	READY	PWRON	ESTP_R	ALRM	WARN	SVON_R	C_STRT_R
1	0				Command code			
2	Command number							
3								
4	Response data							
5								
6								
7								

■ Parameter Read Command

The Parameter Read Command reads SGDH and NS500 Unit parameters.

To use the Parameter Read Command, make the following settings and then change the Command Start Command from 0 to 1.

- Command code
- Parameter number

Table 5.7 Parameter Read Command

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	0	ALRST	ESTP	0	0	SVON	C_STRT
1	0				8			
2	Parameter number							
3								
4	0							
5								
6								
7								

Table 5.8 Response for Parameter Read Command

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	READY	PWRON	ESTP_R	ALRM	WARN	SVON_R	C_STRT_R
1	0				8			
2	Parameter number							
3								
4	Parameter data							
5								
6								
7								

■ Parameter Write Command

The Parameter Write Command writes SGDH and NS500 Unit parameters.

To use the Parameter Write Command, make the following settings and then change the Command Start Command from 0 to 1.

- Command code
- Parameter number
- Parameter data

Table 5.9 Parameter Write Command

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	0	ALRST	ESTP	0	0	SVON	C_STRT
1	0				9			
2	Parameter number							
3								
4	Parameter data							
5								
6								
7								

Table 5.10 Response for Parameter Write Command

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	READY	PWRON	ESTP_R	ALRM	WARN	SVON_R	C_STRT_R
1	0				9			
2	Parameter number							
3								
4	Parameter data							
5								
6								
7								

■ Current Position Setting Command

The Current Position Setting Command sets the specified value as the current position of the servomotor.

To use the Current Position Setting Command, make the following settings and then change the Command Start Command from 0 to 1.

- Command code
- Current position data

Table 5.11 Current Position Setting Command

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	0	ALRST	ESTP	0	0	SVON	C_STRT
1	0				10 (decimal)			
2	0							
3								
4	Current position data							
5								
6								
7								

Table 5.12 Response for Current Position Setting Command

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	READY	PWRON	ESTP_R	ALRM	WARN	SVON_R	C_STRT_R
1	0				10 (decimal)			
2	0							
3								
4	Current position data							
5								
6								
7								

■ Alarm Read Command

The Alarm Read Command reads the last four alarms that have occurred on the SGDH and the NS500 Unit.

To use the Unit Reset Command, make the command code settings and then change the Command Start Command from 0 to 1.

Table 5.13 Alarm Read Command

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	0	ALRST	ESTP	0	0	SVON	C_STRT
1	0				12 (decimal)			
2	0							
3								
4	0							
5								
6								
7								

Table 5.14 Response for Alarm Read Command

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	READY	PWRON	ESTP_R	ALRM	WARN	SVON_R	C_STRT_R
1	0				12 (decimal)			
2	0							
3								
4	Last alarm code							
5	Second last alarm code							
6	Third last alarm code							
7	Fourth last alarm code							

■ Module Reset Command

The Module Reset Command restarts the SGDH and NS500 Unit software. When this command is executed, the NS500 Unit parameters are stored in flash ROM and then the NS500 Unit is restarted.

To use the Module Reset Command, make the command code settings and then change the Command Start Command from 0 to 1.

When the NS500 Unit is executing Module Reset, the Unit Ready Flag is set to 0. When the reset has been completed, the flag is set to 1.

Table 5.15 Unit Reset Command

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	0	ALRST	ESTP	0	0	SVON	C_STRT
1	0				14 (decimal)			
2	0							
3								
4	0							
5								
6								
7								

Table 5.16 Response for Unit Reset Command

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	1	READY	PWRON	ESTP_R	ALRM	WARN	SVON_R	C_STRT_R
1	0				14 (decimal)			
2	0							
3								
4	0							
5								
6								
7								

5.4 Motion Command Methods

5.4.1 Constant Feed Command

■ Function

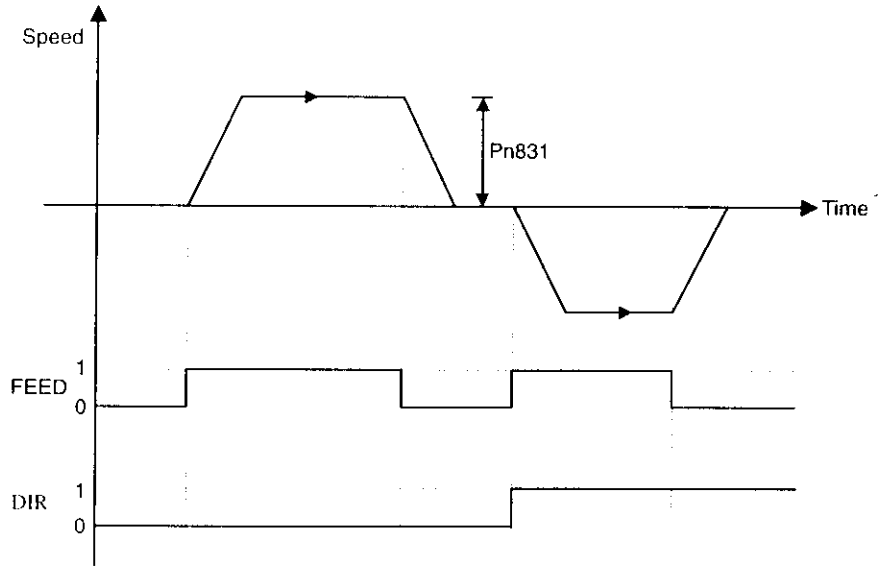
While the Constant Feed Command is set to 1, the axis travels in the direction specified as the movement direction at the speed specified in the parameters. Parameter settings are used for acceleration/deceleration speeds, acceleration/deceleration types, etc.

The speed during movement can be changed by changing the override value.

■ Related Parameters

No.	Name	Setting Range	Unit	Effective Timing	Factory Setting	Type
Pn829	Filter Selection	0, 1, 2, 3	–	Immediate	0	B
Pn830	Constant Feed Reference Unit Selection	0, 1	–	Immediate	0	B
Pn831	Constant Feed Speed	1 to 240,000	1000 steps/min	Immediate	24,000	B
Pn832	Acceleration Time for Constant Feed	1 to 10,000	ms	Immediate	100	B
Pn833	Deceleration Time for Constant Feed	1 to 10,000	ms	Immediate	100	C
Pn834	Switch Speed for Constant Feed Second Accel/Decel	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn835	Accel/Decel Time for Constant FEED Second Accel/Decel	1 to 10,000	ms	Immediate	200	C
Pn836	Accel/Decel Type for Constant Feed	0, 1, 2, 3	–	Immediate	0	B
Pn840	Time Constant for Exponential Accel/Decel	4 to 1,000	ms	Immediate	25	C
Pn841	Bias Speed for Exponential Accel/Decel	1 to 240,000	1000 steps/min	Immediate	0	C
Pn842	Time Constant of Travelling Average	4 to 10,000	ms	Immediate	25	C
Pn843	Maximum Feed Speed	1 to 240,000	1000 steps/min	Immediate	24,000	B

■ Operation



■ Command Method

1. Set the Servo ON Command (byte 0, bit 1) to 1.
2. Set the movement direction (byte 3, bit 1).
3. Set the override value. The Pn830 setting determines whether the override will be set as a ratio (%) or as a speed (1000 steps/min).
4. Set the Feed Command (byte 2, bit 3) to 1.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	1	0	0	1	0
1	Response type				00h			
2	0	0	0	0	1	0	0	0
3	0	0	0	0	0	0	DIR	0
4	Override value (% or 1000 steps/min)							
5								
6								
7								

5.4.2 Step Command

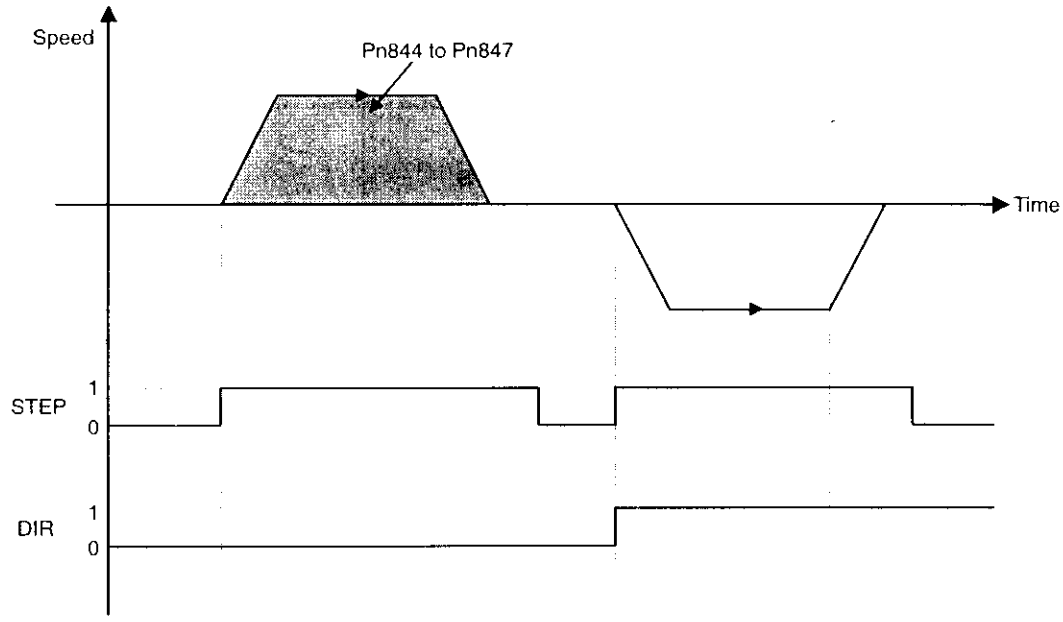
■ Function

When the Step Command is set to 1, the axis will travel in the set direction for the set travel distance and then stop. The travel distance can be selected from four parameters.

■ Related Parameters

No.	Name	Setting Range	Unit	Effective Timing	Factory Setting	Type
Pn821	Feed Speed for Positioning	1 to 240,000	1000 steps/min	Immediate	24,000	B
Pn822	Acceleration Time for Positioning	1 to 10,000	ms	Immediate	100	B
Pn823	Deceleration Time for Positioning	1 to 10,000	ms	Immediate	100	C
Pn824	Switch Speed for Positioning Second Accel/Decel	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn825	Accel/Decel Time for Positioning Second Accel/Decel	1 to 10,000	ms	Immediate	200	B
Pn826	Accel/Decel Type for Positioning	0, 1, 2, 3	–	Immediate	0	B
Pn829	Filter Selection	0, 1, 2, 3	–	Immediate	0	B
Pn840	Time Constant for Exponential Accel/Decel	4 to 1,000	ms	Immediate	25	C
Pn841	Bias Speed for Exponential Accel/Decel	1 to 240,000	1000 steps/min	Immediate	0	C
Pn842	Time Constant of Travelling Average	4 to 10,000	ms	Immediate	25	C
Pn843	Maximum Feed Speed	1 to 240,000	1000 steps/min	Immediate	24,000	B
Pn844	Step Distance 1	±99, 999, 999	Steps	Immediate	1	B
Pn845	Step Distance 2	±99, 999, 999	Steps	Immediate	10	B
Pn846	Step Distance 3	±99, 999, 999	Steps	Immediate	100	B
Pn847	Step Distance 4	±99, 999, 999	Steps	Immediate	1,000	B

■ Operation



■ Command Method

1. Set the Servo ON Command (byte 0, bit 1) to 1.
2. Set the movement direction (byte 3, bit 1).
3. Select the travel distance to be used for step operation from within the range from Pn844 (=0) to Pn847 (=3).
4. Set the Step Command (byte 2, bit 4) to 1.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	1	0	0	1	0
1	Response type				00h			
2	0	0	0	1	0	0	0	0
3	0	0	0	0	0	0	DIR	0
4	Step travel distance selection (0 to 3)							
5								
6								
7								

5.4.3 Station Command

■ Function

The Station Command can be used when the NS500 Unit is used in a rotating system.

One rotation of the servomotor is divided into a specified number of stations and station numbers are allocated.

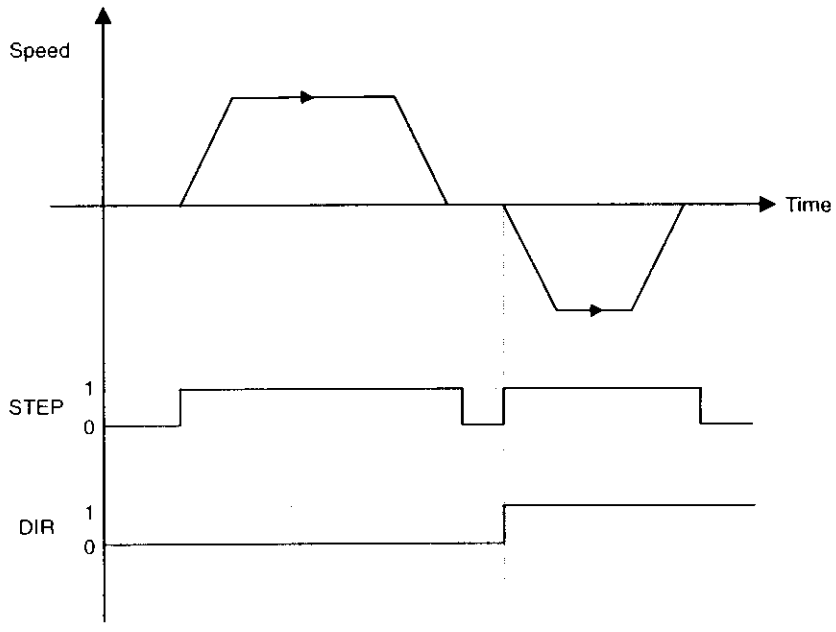
When a station number is specified, the axis travels in the specified direction to specified position.

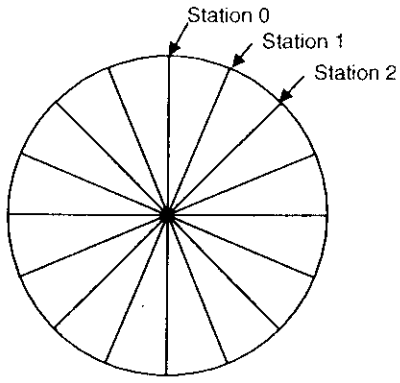
■ Related Parameters

The same speed and acceleration/deceleration data is used as for the Positioning Command.

No.	Name	Setting Range	Unit	Effective Timing	Factory Setting	Type
Pn812	Coordinate Type	0, 1	–	Immediate	0	C
Pn853	Direction for Rotation System	0, 1	–	Immediate	0	B
Pn85A	Number of Stations	1 to 32, 767	–	Immediate	1	B

■ Operation





■ Command Method

1. Set the Servo ON Command (byte 0, bit 1) to 1.
2. Set the movement direction (byte 3, bit 1).
   The movement direction setting is disabled when the Pn853 setting is 1 (travel the shortest distance).
3. Set absolute/incremental (byte 3, bit 0). If an incremental position has been specified, set the value corresponding to (target station number) – (current station number) in bytes 4 to 7.
4. Set the target station number.
5. Set the Station Command (byte 2, bit 5) to 1.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	1	0	0	1	0
1	Response type				00h			
2	0	0	1	0	0	0	0	0
3	0	0	0	0	0	0	DIR	INC
4	Target station number							
5								
6								
7								

5.4.4 Point Table Command

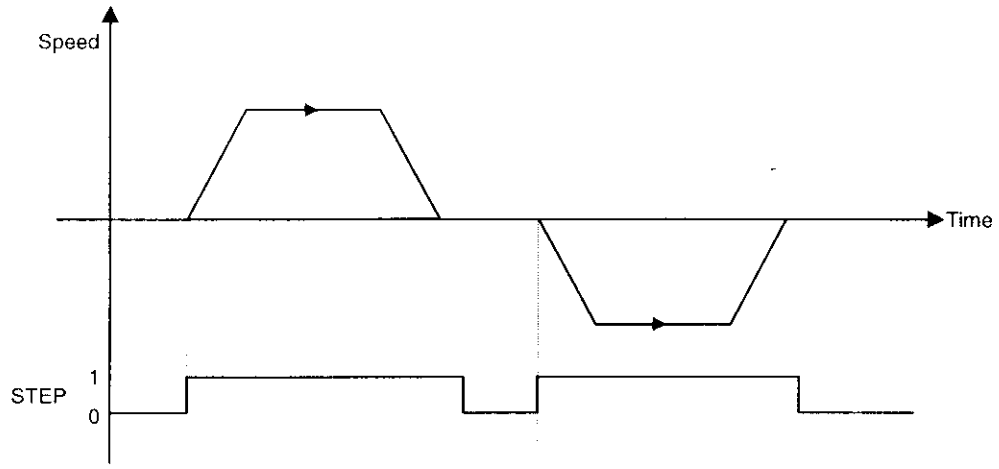
■ Function

The Point Table Command performs positioning at the position and speed stored in advance in the point table.

■ Related Parameters

No.	Name	Setting Range	Unit	Effective Timing	Factory Setting	Type
Pn821	Feed Speed for Positioning	1 to 240,000	1000 steps/min	Immediate	24,000	B
Pn822	Acceleration Time for Positioning	1 to 10,000	ms	Immediate	100	B
Pn823	Deceleration Time for Positioning	1 to 10,000	ms	Immediate	100	C
Pn824	Switch Speed for Positioning Second Accel/Decel	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn825	Accel/Decel Time for Positioning Second Accel/Decel	1 to 10,000	ms	Immediate	200	B
Pn826	Accel/Decel Type for Positioning	0, 1, 2, 3	–	Immediate	0	B
Pn829	Filter Selection	0, 1, 2, 3	–	Immediate	0	B
Pn840	Time Constant for Exponential Accel/Decel	4 to 1,000	ms	Immediate	25	C
Pn841	Bias Speed for Exponential Accel/Decel	1 to 240,000	1000 steps/min	Immediate	0	C
Pn842	Time Constant of Travelling Average	4 to 10,000	ms	Immediate	25	C
Pn843	Maximum Feed Speed	1 to 240,000	1000 steps/min	Immediate	24,000	B
Pn900	Target Position 1	±99, 999, 999	Steps	Immediate	0	B
Pn901	Target Position 2	±99, 999, 999	Steps	Immediate	0	B
:	:					
Pn931	Target Position 50	±99, 999, 999	Steps	Immediate	0	B
Pn980	Target Speed 1	1 to 240,000	1000 steps/min	Immediate	0	B
Pn981	Target Speed 2	1 to 240,000	1000 steps/min	Immediate	0	B
:	:					
Pn971	Target Speed 50	1 to 240,000	1000 steps/min	Immediate	0	B

■ Operation



■ Command Method

1. Set the Servo ON Command (byte 0, bit 1) to 1.
2. Set absolute/incremental (byte 3, bit 0). If an incremental position has been specified, the target position will be (current position) + (position stored in point table).
3. Set the point table number to be specified.
4. Set the Point Table Command (byte 2, bit 6) to 1.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	1	0	0	1	0
1	Response type				00h			
2	0	1	0	0	0	0	0	0
3	0	0	0	0	0	0	DIR	INC
4	Point table number to be specified							
5								
6								
7								

5.4.5 Zero Point Return Command

■ Function

The Zero Point Return Command moves the axis in the specified direction, and sets the zero point based on the specified zero point return mode.

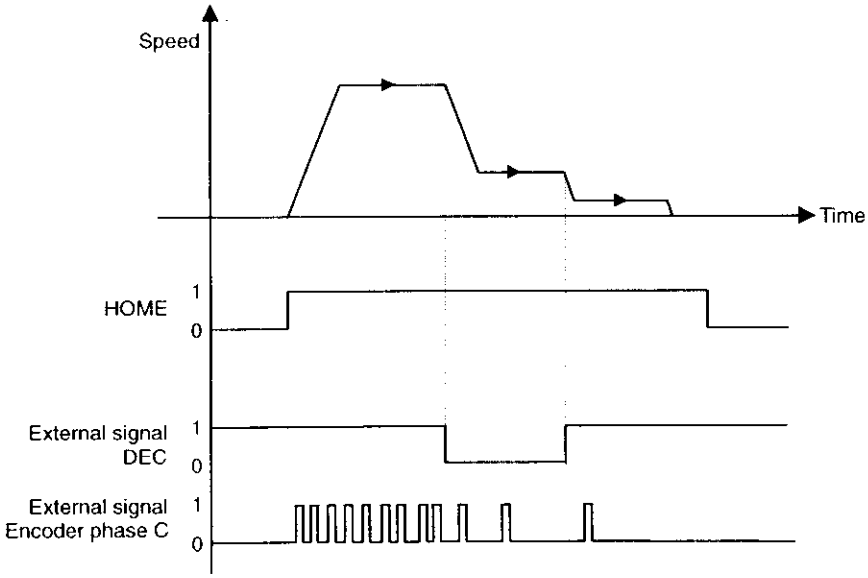
When an absolute position detection system has been selected, the positioning will be performed to the zero point.

■ Related Parameters

No.	Name	Setting Range	Unit	Effective Timing	Factory Setting	Type
Pn800	Zero Point Return Mode	0 to 3	–	Immediate	0	B
Pn801	Zero Point Return Function Selection	0 to 7	–	Power-up	1	B
Pn802	Feed Speed for Zero Point Return	1 to 240,000	1000 steps/min	Immediate	10,000	B
Pn803	Approach Speed for Zero Point Return	1 to 240,000	1000 steps/min	Immediate	1,000	B
Pn804	Creep Speed for Zero Point Return	1 to 240,000	1000 steps/min	Immediate	500	B
Pn805	Final Travel Distance for Zero Point Return	0 to 99,999,999	Steps	Immediate	0	B
Pn806	Output Width for Zero Point Return	0 to 32, 767	Steps	Immediate	100	B
Pn809	Zero Point Offset	–99,999,999 to 99,999,999	Steps	Immediate	0	C
Pn80A	Accel/Decel Time for Zero Point Return	1 to 10,000	ms	Immediate	100	B

■ Operation

The Zero Point Return Command performs zero point return based on each zero point return mode.



■ Command Method

Set the Servo ON Command (byte 0, bit 1) to 1.

Set the Zero Point Return Command (byte 2, bit 7) to 1.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	1	0	0	1	0
1	Response type				00h			
2	1	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	0							
5								
6								
7								

5

5.4.6 Positioning Command

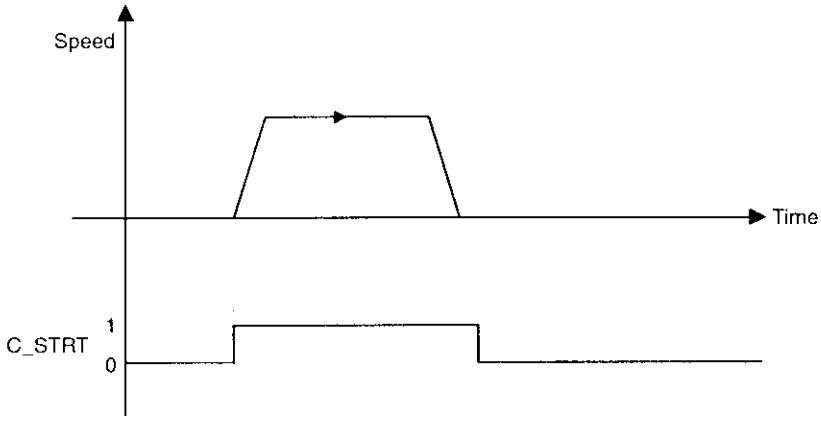
■ Function

The Positioning Command performs positioning to the specified target position.

■ Related Parameters

No.	Name	Setting Range	Unit	Effective Timing	Factory Setting	Type
Pn821	Feed Speed for Positioning	1 to 240,000	1000 steps/min	Immediate	24,000	B
Pn822	Acceleration Time for Positioning	1 to 10,000	ms	Immediate	100	B
Pn823	Deceleration Time for Positioning	1 to 10,000	ms	Immediate	100	C
Pn824	Switch Speed for Positioning Second Accel/ Decel	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn825	Accel/Decel Time for Positioning Second Accel/Decel	1 to 10,000	ms	Immediate	200	B
Pn826	Accel/Decel Type for Positioning	0, 1, 2, 3	–	Immediate	0	B
Pn829	Filter Selection	0, 1, 2, 3	–	Immediate	0	B
Pn840	Time Constant for Exponential Accel/Decel	4 to 1,000	ms	Immediate	25	C
Pn841	Bias Speed for Exponential Accel/Decel	1 to 240,000	1000 steps/min	Immediate	0	C
Pn842	Time Constant of Travelling Average	4 to 10,000	ms	Immediate	25	C
Pn843	Maximum Feed Speed	1 to 240,000	1000 steps/min	Immediate	24,000	B

■ Operation



■ Command Method

1. Set the command code (byte 1, bits 0 to 3) to no operation (= 0) if it is not already set to 0.
2. Set the Servo ON Command (byte 0, bit 1) to 1.
3. Set absolute/incremental (byte 3, bit 0). If an incremental position has been specified, the target position will be (current position) + (position specified from bytes 4 to 7).

4. Set the target position in the command data (bytes 4 to 7).
5. Set simple positioning (=1) in the command code (byte 1, bits 0 to 3).
6. Change the Command Start Command (byte 0, bit 0) from 0 to 1.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	1	0	0	1	1
1	Response type				00h			
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	Target position data							
5								
6								
7								

5.4.7 External Positioning

5

■ Function

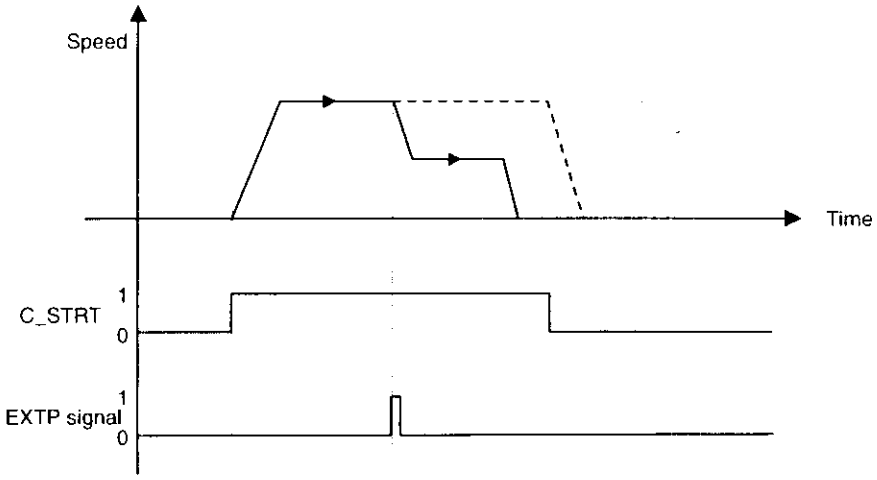
The External Positioning Command performs positioning at the specified target position. If the status of the external signal changes during movement, the axis will decelerate to the external positioning approach speed from the position where the status changed and travel the distance specified in the parameter.

■ Related Parameters

The same speed and acceleration/deceleration data is used as for the Positioning Command.

No.	Name	Setting Range	Unit	Effective Timing	Factory Setting	Type
Pn854	Approach Speed for External Positioning	1 to 240,000	1,000 steps/min	Immediate	24,000	B
Pn855	Travel Distance for External Positioning	0 to 99, 999, 999	Steps	Immediate	0	B

■ Operation



■ Command Method

1. Set the command code (byte 1, bits 0 to 3) to no operation (= 0), if it is not already set to 0.
2. Set the Servo ON Command (byte 0, bit 1) to 1.
3. Set absolute/incremental (byte 3, bit 0). If an incremental position has been specified, the target position will be (current position) + (position specified from bytes 4 to 7).
4. Set the target position in the command data (bytes 4 to 7).
5. Set external positioning (=2) in the command code (byte 1, bits 0 to 3).
6. Change the Command Start Command (byte 0, bit 0) from 0 to 1.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	1	0	0	1	1
1	Response type				00h			
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	Target position data							
5								
6								
7								

5.4.8 Notch Output Positioning Command

■ Function

The Notch Output Positioning Command performs positioning to the specified position.

If a specified position is passed during the positioning, a notch output signal (notch signal) will be output.

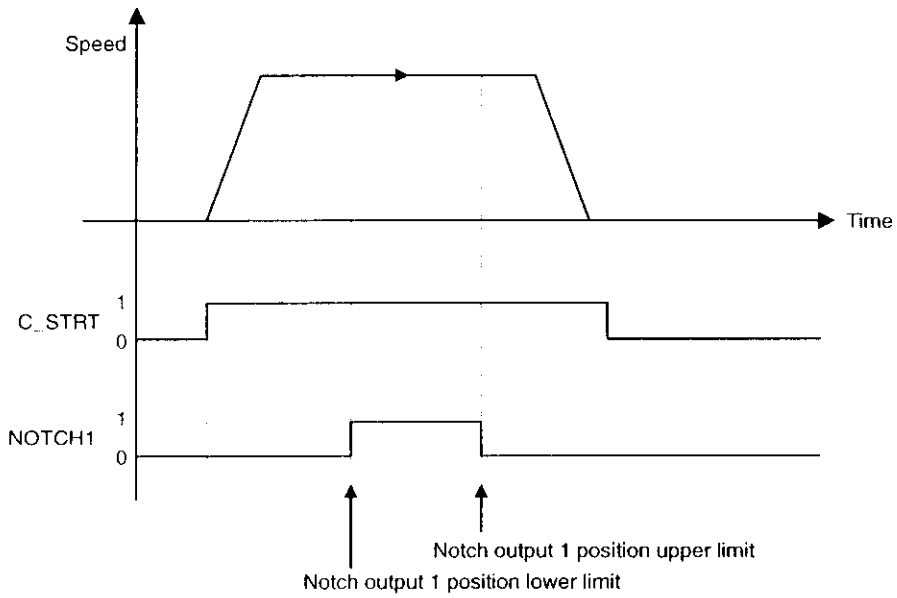
Two notch signals can be used in the NS500 Unit.

■ Related Parameters

No.	Name	Setting Range	Unit	Effective Timing	Factory Setting	Type
Pn890	Notch Signal Output Position Setting	0, 1	-	Immediate	0	C
Pn891	Notch Signal Output Setting	0 to 3	-	Immediate	0	C
Pn892	Notch 1 Output Position Lower Limit	±99, 999, 999	Steps	Immediate	0	C
Pn893	Notch 1 Output Position Upper Limit	±99, 999, 999	Steps	Immediate	0	C
Pn894	Notch 2 Output Position Lower Limit	±99, 999, 999	Steps	Immediate	0	C
Pn895	Notch 2 Output Position Upper Limit	±99, 999, 999	Steps	Immediate	0	C

5

■ Operation



■ Command Method

1. Set the command code (byte 1, bits 0 to 3) to no operation (= 0), if it is not already set to 0.
2. Set the Servo ON Command (byte 0, bit 1) to 1.
3. Set absolute/incremental (byte 3, bit 0). If an incremental position has been specified, the target position will be (current position) + (position specified from bytes 4 to 7).
4. Set the target position in the command data (bytes 4 to 7).
5. Set positioning with notch signal output (=3) in the command code (byte 1, bits 0 to 3).
6. Change the Command Start Command (byte 0, bit 0) from 0 to 1.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	1	0	0	1	1
1	Response type				00h			
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	Target position data							
5								
6								
7								

5.4.9 Multi-speed Positioning Command

■ Function

The Multi-speed Positioning Command changes the speed in stages and performs positioning to specified positions.

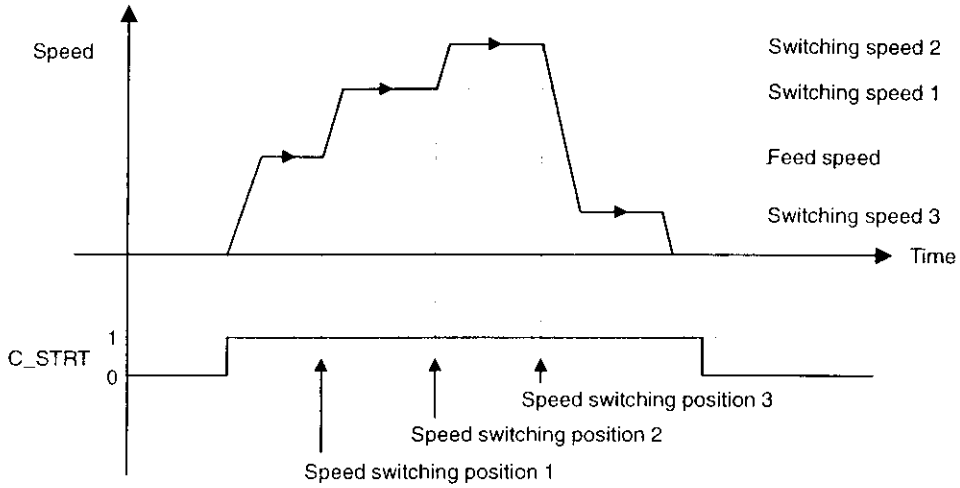
When the positions specified in the parameters are reached during axis travel, the axis switches to the next set speed and travels to the position specified in the next stage. Up to 16 speed switching positions can be set.

■ Related Parameters

No.	Name	Setting Range	Unit	Effective Timing	Factory Setting	Type
Pn860	Speed Switching Position Setting	–	–	Immediate	0	C
Pn861	Number of Points for Speed Switching	–	–	Immediate	0	C
Pn862	Initial Feed Speed for Multi-speed Positioning	1 to 240,000	1000 steps/min	Immediate	0	C
Pn863	Speed Switching Position 1	0 to 99, 999, 999	Steps	Immediate	0	C
Pn864	Speed Switching Position 2	0 to 99, 999, 999	Steps	Immediate	0	C
Pn865	Speed Switching Position 3	0 to 99, 999, 999	Steps	Immediate	0	C
Pn866	Speed Switching Position 4	0 to 99, 999, 999	Steps	Immediate	0	C
Pn867	Speed Switching Position 5	0 to 99, 999, 999	Steps	Immediate	0	C
Pn868	Speed Switching Position 6	0 to 99, 999, 999	Steps	Immediate	0	C
Pn869	Speed Switching Position 7	0 to 99, 999, 999	Steps	Immediate	0	C
Pn86A	Speed Switching Position 8	0 to 99, 999, 999	Steps	Immediate	0	C
Pn86B	Speed Switching Position 9	0 to 99, 999, 999	Steps	Immediate	0	C
Pn86C	Speed Switching Position 10	0 to 99, 999, 999	Steps	Immediate	0	C
Pn86D	Speed Switching Position 11	0 to 99, 999, 999	Steps	Immediate	0	C
Pn86E	Speed Switching Position 12	0 to 99, 999, 999	Steps	Immediate	0	C
Pn86F	Speed Switching Position 13	0 to 99, 999, 999	Steps	Immediate	0	C
Pn870	Speed Switching Position 14	0 to 99, 999, 999	Steps	Immediate	0	C

No.	Name	Setting Range	Unit	Effective Timing	Factory Setting	Type
Pn871	Speed Switching Position 15	0 to 99, 999, 999	Steps	Immediate	0	C
Pn872	Speed Switching Position 16	0 to 99, 999, 999	Steps	Immediate	0	C
Pn873	Switching Speed 1	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn874	Switching Speed 2	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn875	Switching Speed 3	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn876	Switching Speed 4	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn877	Switching Speed 5	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn878	Switching Speed 6	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn879	Switching Speed 7	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn87A	Switching Speed 8	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn87B	Switching Speed 9	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn87C	Switching Speed 10	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn87D	Switching Speed 11	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn87E	Switching Speed 12	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn87F	Switching Speed 13	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn880	Switching Speed 14	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn881	Switching Speed 15	1 to 240,000	1000 steps/min	Immediate	24,000	C
Pn882	Switching Speed 16	1 to 240,000	1000 steps/min	Immediate	24,000	C

■ Operation



■ Command Method

1. Set the command code (byte 1, bits 0 to 3) to no operation (= 0), if it is not already set to 0.
2. Set the Servo ON Command (byte 0, bit 1) to 1.
3. Set absolute/incremental (byte 3, bit 0). If an incremental position has been specified, the target position will be (current position) + (position specified from bytes 4 to 7).
4. Set the target position in the command data (bytes 4 to 7).
5. Set multi-speed positioning (=4) in the command code (byte 1, bits 0 to 3).
6. Change the Command Start Command (byte 0, bit 0) from 0 to 1.

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	1	0	0	1	1
1	Response type				00h			
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	Target position data							
5								
6								
7								

5.5 Commands from the Host Controller

5.5.1 Basic Sequence

Some examples of basic command sequences for the NS500 Unit are shown below.

■ Move Commands (Using Command Bit)

1. Confirm the following conditions in the response data:
   READY = 1, /ESTP_R = 1, ALRM = 0 (WARN = 0).
2. Confirm the following conditions in the response data:
   SVON_R = 1, PRGS = 0 (INPOS = 1), and the move command bit = 0.
3. Set the command bit and command data for the move command.
4. Check command completion using the specified position (or station number or point table number), and by confirming that PRGS = 0 and INPOS = 1.
5. Set the move command bit to 0.

■ Move Commands (Using Command Code)

1. Confirm the following conditions in the response data:
   READY = 1, /ESTP_R = 1, ALRM = 0 (WARN = 0).
2. Confirm the following conditions in the response data:
   SVON_R = 1, PRGS = 0 (INPOS = 1), C_START = 0, and the command code = 0.
3. Set the command data and command code for the move command, and set C_START to 1.
4. Check command completion using the specified position (or station number or point table number), and by confirming that PRGS = 0 and INPOS = 1.
5. Set the command code and C_START to 0.

■ Set/Read Commands

1. Confirm that READY = 1 in the response data.
2. Confirm that the command code = 0.
3. Set the setting data and the command code.
4. Check command completion using the setting data and the command code, and by confirming that C_START_R = 1 and READY = 1.
5. Set the command code and C_START to 0.

■ Holding Move Commands

1. Set HOLD to 1.

2. Check hold status by confirming that HOLD_R = 1 and INPOS = 1 in the response data.
3. Release the hold status by setting HOLD to 0.

■ Cancelling Move Commands

1. Set CANCEL to 1 (or set the move command bit to 0).
2. Check that the command has been cancelled by confirming that PRGS = 0 and INPOS = 1.
3. Set the move command bit and CANCEL to 0.

■ Operating Sequences for Alarms

1. If an alarm is detected (i.e., ALRM = 1), set SVON to 0 and CANCEL to 1 (or clear the move command).
2. Read the alarm code, and remove the cause of the alarm.
3. If the move command has not been cleared, clear the move command and set CANCEL to 0.
4. Set ALRST to 1 and confirm that ALRM = 0.
5. Before resuming operation, set SVON to 1 and confirm that SVON_R = 1.

■ Emergency Stop

1. ESTP can be executed at any time while READY = 1 (except during Module Reset).
2. To clear the stopped status, change SVON from 0 to 1 and check that SVON_R = 1 before resuming operation.

5.5.2 Command Method

For the following commands that involve movement, always wait until one command has been completed before executing another command. If commands are executed simultaneously or while the axis is travelling, a command error warning will occur (A.95).

- Feed Command
- Step Command
- Station Command
- Point Table Command
- Zero Point Return Command
- Move command based on a Command Start Command

The Emergency Stop, Servo ON, Cancel, and Hold Commands are effective any time.

■ Servo ON/OFF Command

When the Servo ON Command (SVON) is changed from 0 to 1, current is supplied to the SGDH. When it is changed from 1 to 0, the current is not supplied.

If a PROFIBUS-DP communications error occurs, the NS500 Unit automatically enters Servo OFF status. To restart communications, the Servo ON Command must be changed from 0 to 1.

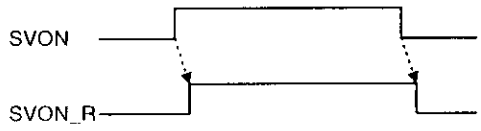


Figure 5.1 Servo ON/OFF Signal

■ Emergency Stop Command

While the Emergency Stop Command (/ESTP) is set to 0, the SGDH is in emergency stop status. During this status, the Emergency Stop Flag (/ESTP_R) is 0.

The emergency stop status can be released by setting the Emergency Stop Command (/ESTP) to 1 and changing the Servo ON Command (SVON) from 0 to 1.

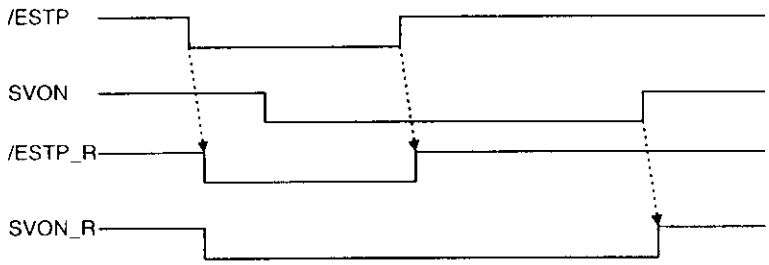


Figure 5.2 Emergency Stop Command

■ Alarm Reset Command

When an alarm occurs, use the following procedure to restart the NS500 Unit.

1. Set the Servo ON Command (SVON) to 0 and set the Cancel Command (CANCEL) to 1.
2. Remove the cause of the alarm.
3. Clear any move commands that have been set.
4. Execute the Alarm Reset Command.
5. Check that the Alarm Flag (ALRM) is 0.

Alarm reset is executed by changing the Alarm Reset Command (ALRST) from 0 to 1. When execution of the alarm reset has been completed and all alarms have been cleared, the alarm bit (ALRM) will change to 0.

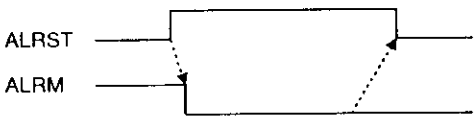


Figure 5.3 Alarm Rest Command

■ Constant Feed Command

While the Constant Feed Command (FEED) is set to 1, the axis travels in the direction specified as the movement direction (DIR) at the feed speed.

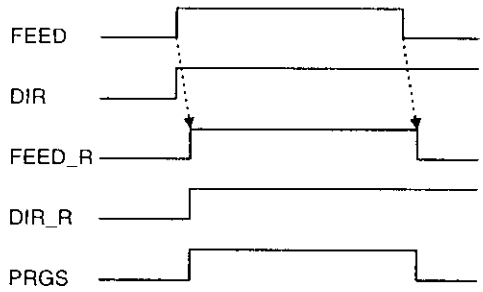


Figure 5.4 Constant Feed Command

■ Step Command

While the Step Command (STEP) is set to 1, the axis travels in the direction specified as the movement direction (DIR) at the feed speed for the step travel distance.

If the Step Command is set to 0 during the step operation, the step operation stops and the remaining travel distance is canceled.

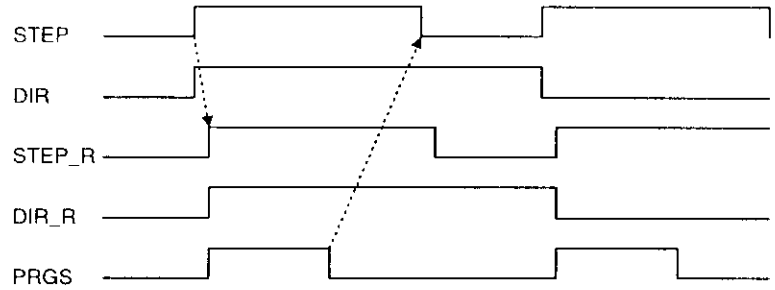


Figure 5.5 Step Command

■ Station Command

The station operation starts when the Station Command (STN) is changed from 0 to 1. The following data must be set before the station operation is started.

- Rotation direction: Specified in the byte 3 area.
- Station number: Specified in bytes 7 and 6 of word 1.
- Absolute/incremental : Specify whether the station number is an absolute value or an incremental value.

■ Point Table Command

The point table operation starts when the Point Table Command (PTBL) is changed from 0 to 1. The following data must be set before the operation is started.

- Point table number: Specified in bytes 7 and 6 of word 1.

■ Zero Point Return Command

When the Zero Point Return Command (HOME) is changed from 0 to 1, the axis travels in the direction specified in the zero point return direction parameter. If the Zero Point Return Command is changed from 1 to 0 during zero point return, the zero point return stops. Therefore, the Zero Point Return Command must be maintained to 1 until the zero point return has been completed.

Using an Incremental Detection System

When the power is turned ON, the current position is 0 and the Zero Point Flag (HOME_P) is 0. When the zero point return has been completed, the Zero Point Flag changes to 1.

Using an Absolute Value Detection System

When the Zero Point Return Command is changed from 0 to 1, the zero point return is not performed but the axis is positioned to the machine coordinate zero point based on the zero point return feed speed parameter.

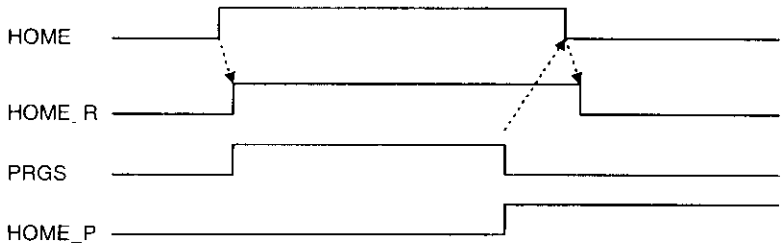


Figure 5.6 Zero Point Return Command

■ Positioning Command

When the Command Start Command (C_STRT) is changed from 0 to 1, positioning starts according to the command code.

If the Hold Command (HOLD) is changed from 0 to 1 during execution of positioning, axis travel is held. Confirm that the Hold Command has been received by checking that the Holding Flag (HOLD_R) is set to 1. Change the Hold Command from 1 to 0 to restart the remaining axis travel.

If the Cancel Command (CANCEL) is changed from 0 to 1 during execution of the positioning, the moving axis decelerates to stop and the remaining travel distance is discarded. Confirm that the Cancel Command has been received by checking that the Progressing Flag (PRGS) has changed from 1 to 0.

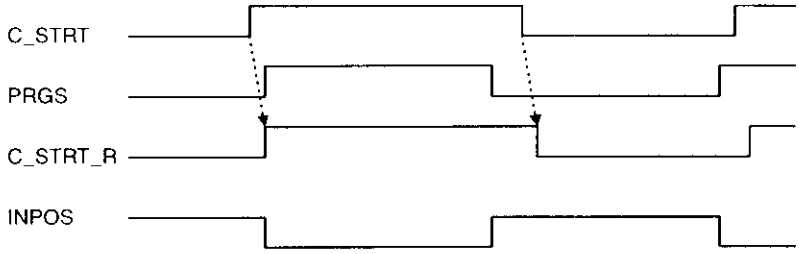


Figure 5.7 Positioning Command

■ Module Reset Command

The Unit is reset by setting the Module Reset Command and changing the Command Start Command (C_STRT) from 0 to 1. When the Module Reset Command is executed, the Unit Ready Flag (READY) is changed from 1 to 0. When NS500 Unit and SGDH reset processing has been completed, the Unit Ready Flag changes from 0 to 1.

The Unit reset operation process is outlined below.

- If the axis is travelling, it decelerates to stop and the remaining travel distance is discarded.
- If the current status is servo ON, it changes to servo OFF.
- If an alarm has occurred, the alarm is reset.
- All of the latest NS500 Unit parameters are stored in flash memory.

6

Parameter Settings

This chapter describes parameters and standard settings for I/O signals (CN1) when an NS500 Unit is mounted.

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6.1 Parameters and Standard Settings for NS500 Units

6.1.1 Automatically Set Parameters

When an NS500 Unit is mounted on an SGDH SERVOPACK and it is used for DeviceNet communications, the following parameters are automatically set. The following parameters will be treated as "reserved for system use," so do not change them. The SGDH SERVOPACK will be set for position control. It is not necessary to set parameters for speed and torque control, so do not change the settings.

Pn No.	Digit	Parameter Name	Set Value	Description
Pn000	1	Select control method	1	Position control
Pn004	1	Reserved	0	---
Pn200	2	Clear signal status	1	Error counter is not cleared.
Pn202	---	Electronic Gear Ratio (Numerator)	1	Electronic gear on SGDH SERVOPACK is not used.
Pn203	---	Electronic Gear Ratio (Denominator)	1	Electronic gear on SGDH SERVOPACK is not used.
Pn204	---	Position command acceleration/deceleration time constant	0	Time constant = 0
Pn207	1	Select position command filter	0	Uses the position command acceleration/deceleration filter.
Pn50A	---	Select input signal 1	8881	Not used
Pn50B	---	Select input signal 2	□□81	Not used
Pn50C	---	Select input signal 3	8888	Not used
Pn50D	---	Select input signal 4	8888	Not used
Pn511	0	Select input signal 5	8	Not used

INFO

These parameters are set automatically the first time the power to the SERVOPACK is turned ON after the NS500 Unit has been mounted. Startup will take approximately 6 seconds when these parameters are being set.

6.1.2 Standard Settings for CN1 I/O Signals

The standards settings for CN1 I/O signals when the NS500 Unit is mounted are described below. To use the standard settings, change the parameters to the standard setting as shown below. The input signal setting from the NS500 Unit will be force-changed, so the user cannot change this setting.

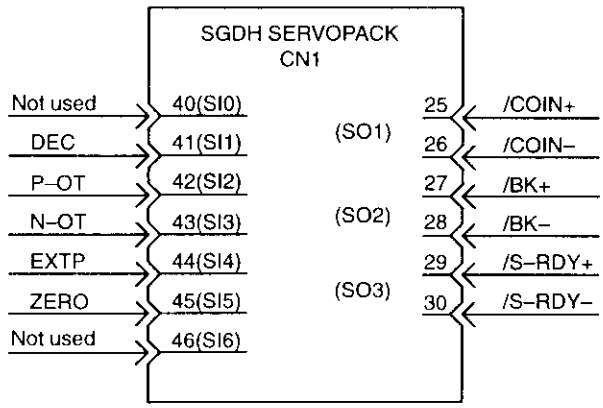


Figure 6.1 Standard CN1 I/O Signal Settings

Table 6.1 Factory Settings and Standard Settings for I/O Signals

Parameter	Description	Factory Setting	Standard Setting
Pn50E	Output signal selections 1	3211	3001
Pn50F	Output signal selections 2	0000	0200
Pn510	Output signal selections 3	0000	0000

6

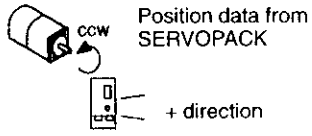
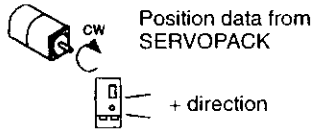
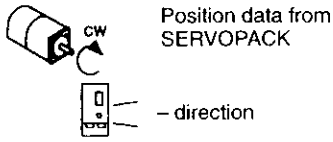
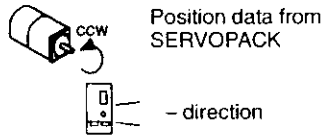
6.2 Settings According to Equipment Characteristics

This section describes the procedure for setting parameters according to the dimensions and performance of the equipment used.

6.2.1 Switching Servomotor Rotation Direction

The SERVOPACK has a Reverse Rotation Mode that reverses the direction of servomotor rotation without rewiring. Forward rotation in the standard setting is defined as counterclockwise as viewed from the load.

With the Reverse Rotation Mode, the direction of servomotor rotation can be reversed without changing other items. The direction (+, –) of shaft motion is reversed. There are no other changes.

	Standard Setting	Reverse Rotation Mode
Forward Reference		
Reverse Reference		

■ Setting Reverse Rotation Mode

Use parameter Pn000.0.

Pn000.0	Direction Selection	Factory Setting: 0	Position Control

Use the following settings to select the direction of servomotor rotation.

Setting	Description	
0	Forward rotation is defined as counterclockwise (CCW) rotation as viewed from the load.	(Standard setting)
1	Forward rotation is defined as clockwise (CW) rotation as viewed from the load.	(Reverse Rotation Mode)

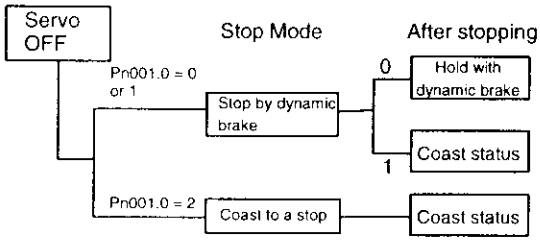
6.2.2 Stop Mode Selection at Servo OFF

The SGDH SERVOPACK turns OFF under the following conditions:

- The SV_OFF command is transmitted.
- A servo alarm occurs.
- Power is turned OFF.

Specify the Stop Mode if any of these occurs during servomotor operation.

Pn001.0	Servo OFF Stop Mode	Factory Setting: 0	Position Control



The dynamic brake electrically applies a brake by using a resistor to consume servomotor rotation energy.
Refer to *6.5.1 Using the Dynamic Brake.*

Parameter	Setting	Item
Pn001.0	0 (Factory setting)	Uses the dynamic brake to stop the servomotor, and maintains dynamic brake status after stopping.
	1	Uses the dynamic brake to stop the servomotor, and cancels dynamic brake status after stopping to go into coast status.
	2	Coasts the servomotor to a stop. The servomotor is turned OFF and stops due to equipment friction.

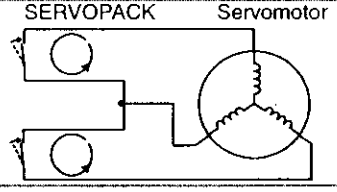
Note If the servomotor is stopped or rotating at extremely low speed when the item above is set to 0 (dynamic brake status after stopping with the dynamic brake), then braking power is not generated and the servomotor will coast to a stop the same as in coast status.

6

TERMS

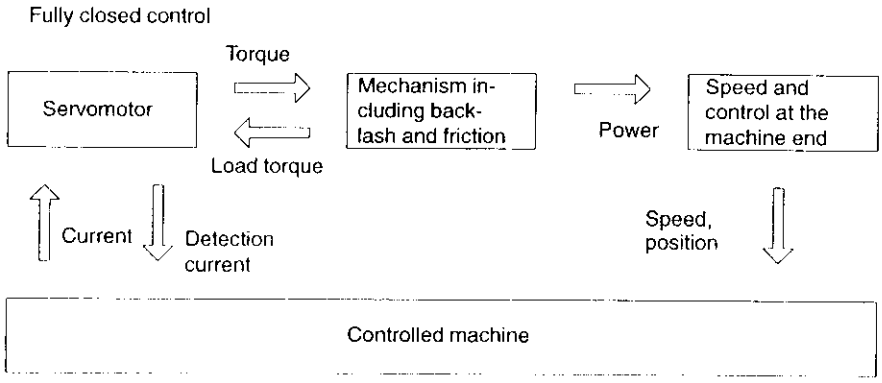
◆ Dynamic brake (DB)

The dynamic brake is a common way of suddenly stopping a servomotor. Built into the SERVOPACK, the dynamic brake suddenly stops a servomotor by electrically shorting its electrical circuit.



6.2.3 Fully Closed Control

A fully closed loop can be formed using the parameter settings on the SGDH SERVOPACK. In previous SERVOPACKs, a semi-closed method was used to control the motor, but with this function even more precise control is achieved because control involves the detection of the position and speed of actual machine operation.



Parameters must be set when using fully closed control. Refer to *6.2.5 Parameter Settings* for details.

6.2.4 Fully Closed System Specifications

This section describes the fully closed system specifications of the SGDH SERVOPACK when an Option Unit is mounted.

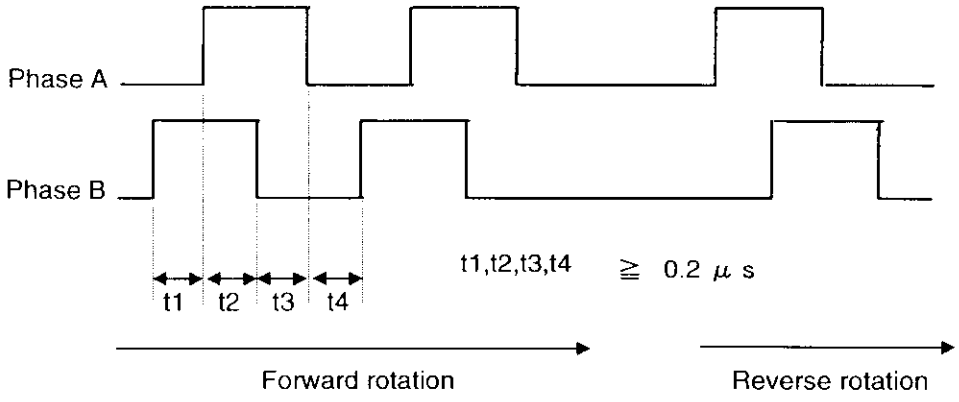
■ Fully Closed Encoder Pulse Output Form

5-V Differential line driver output (complies with EIA Standard RS-422A)

■ Fully Closed Encoder Pulse Signal Form

90° Phase difference 2-phase differential pulse: phase A, phase B

Maximum receivable frequency for SERVOPACK: 1 Mbps



6.2.5 Parameter Settings

This section describes the parameters that must be set when using an Option Unit.

■ Overflow Level

For information on parameter contents, refer to *6.2.1 Servo Gain Settings* of the *Σ-II Series SGM□H/SGDH User's Manual : Design and Maintenance* (SIE-S800-32.2). The factory setting is made to minimize the chance of the motor going out of control due to wiring errors or other causes. After performing a trial operation at a low speed, change the setting to a higher value if necessary.

■ Fully Closed Encoder

Set the method for using the fully closed encoder.

Pn002.3	Fully Closed Encoder Usage Method	Factory Setting: 0	Position Control

The setting details are as follows:

Parameter	Setting	Meaning
Pn002.3	0 (Factory setting)	Fully closed encoder is not used.
	1	Fully closed encoder is used without phase C.
	2	Fully closed encoder is used with phase C.
	3	Fully closed encoder is used in Reverse Rotation Mode without phase C.
	4	Fully closed encoder is used in Reverse Rotation Mode with phase C.

When changes have been made to this parameter, turn OFF the power once. The set value will become effective when the power is turned ON again.

■ Number of Fully Closed Encoder Pulses

Set the number of fully closed encoder pulses for each motor rotation.

When the number of fully closed encoder pulses per motor rotation is not an integer, set the closest integer.

Error will occur in the speed monitor for position loop gain, feed forward, and reference pulse, but no position displacement will occur. Set the number of pulses with a multiplication factor of 1.

Pn206	Number of Fully Closed Encoder Pulses	Unit P/R	Setting Range: 513 to 32768	Factory Setting: 16384	Position Control

When changes have been made to this parameter, turn OFF the power once. The set value will become effective when the power is turned ON again.

6.3 Settings According to Host Controller

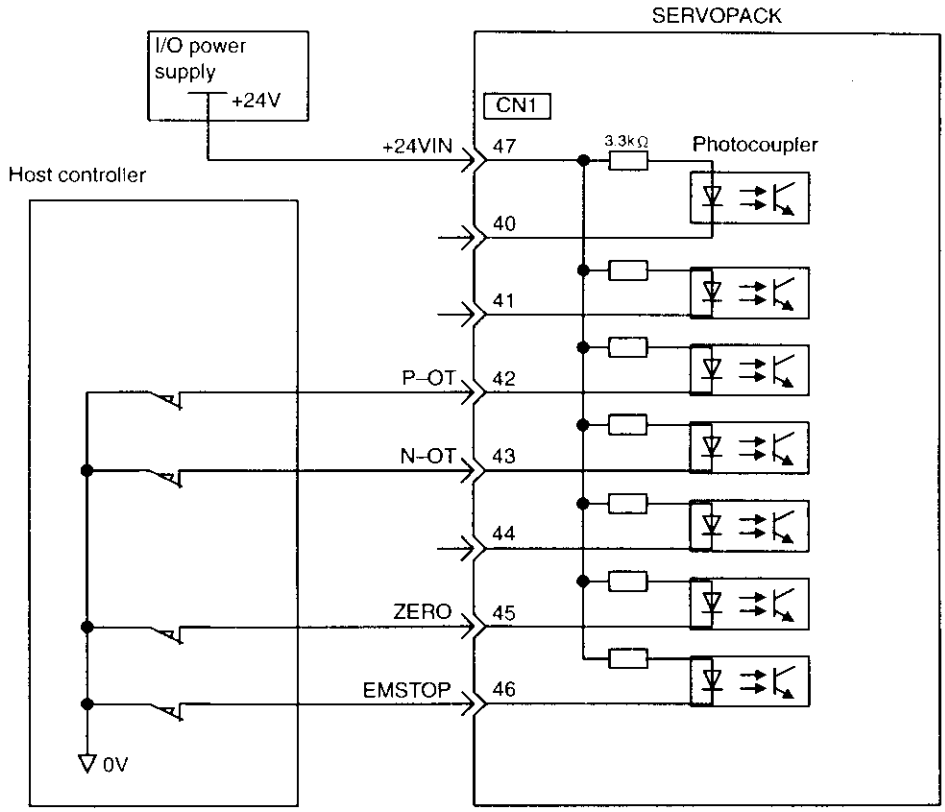
This section describes the procedure for connecting the SERVOPACK to the host controller and provides details on related parameters.

6.3.1 Sequence I/O Signals

Sequence I/O signals are used to control SERVOPACK operation. Connect these signal terminals as required.

■ Input Signal Connections

Connect the sequence input signals as shown below (standard settings).



IMPORTANT

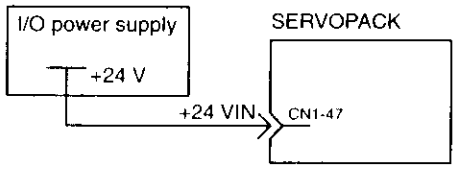
Provide an external input power supply; the SERVOPACK does not have an internal 24-V power supply.

- Sequence input signal power supply specifications: 24 ± 1 VDC, 50 mA min.

Yaskawa recommends using the same external power supply as that used for output circuits. The allowable voltage range for the 24-V sequence input circuit power supply is 11 to 25 V. Although a 12-V power supply can be used, contact faults can easily occur for relays and other mechanical contacts under low currents. Confirm the characteristics of relays and other mechanical contacts before using a 12-V power supply.

→ Input +24V IN CN1-47	24 V External I/O Power Supply Input	Position Control

The external power supply input terminal is common to sequence input signals.

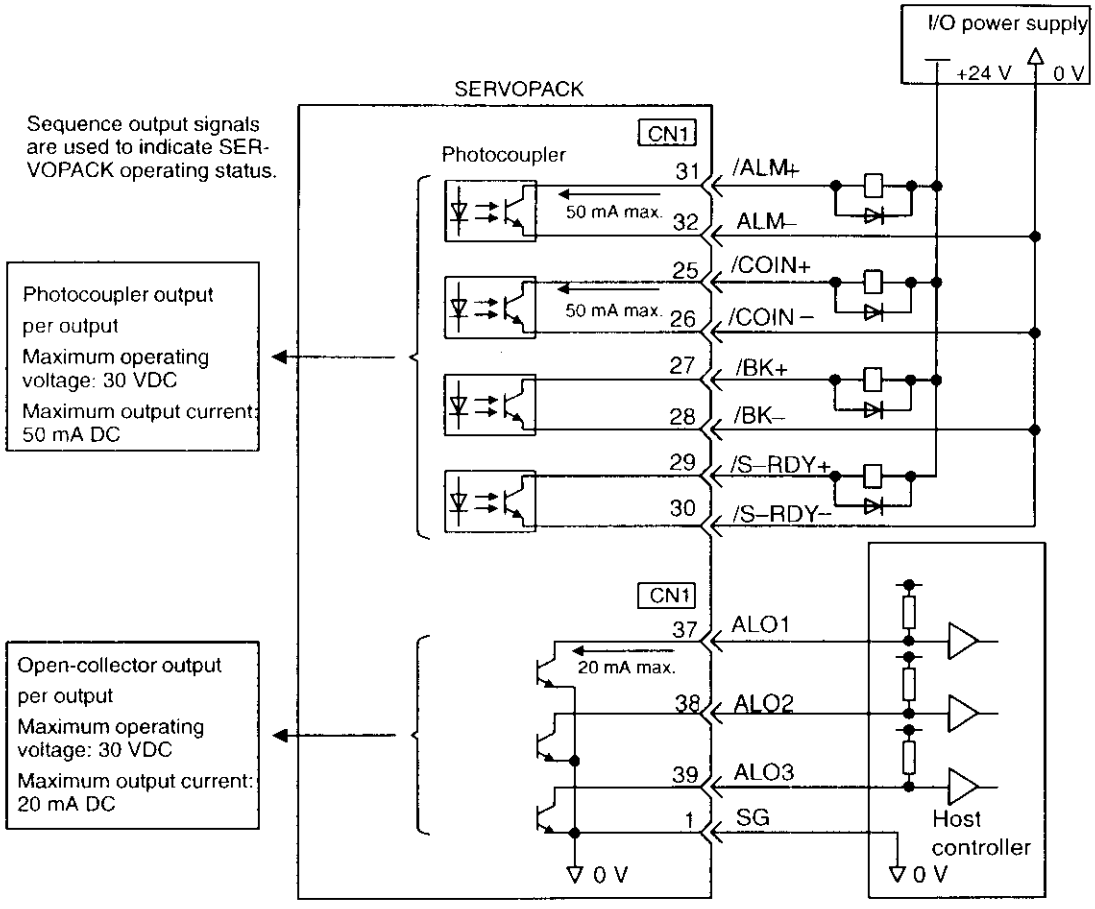


Connect an external I/O power supply.

Contact input signals: DEC (CN1-41)
P-OT (CN1-42)
N-OT (CN1-43)
EXTP (CN1-44)
ZERO (CN1-45)

■ Output Signal Connections

Connect the sequence output signals as shown in the following figure (standard settings).



IMPORTANT

Provide a separate external I/O power supply; the SERVOPACK does not have an internal 24-V power supply. Yaskawa recommends using the same type of external power supply as that used for input circuits.

Function allocations for some sequence output signal circuits can be changed.

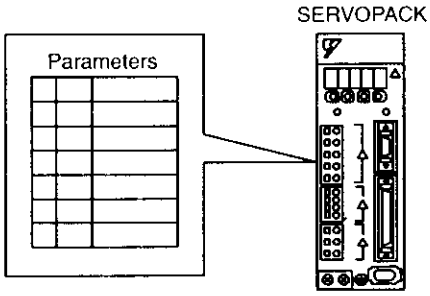
Refer to *6.4.3 Output Circuit Signal Allocations* for more details.

6.4 Setting Up the SERVOPACK

This section describes the procedure for setting parameters to operate the SERVOPACK.

6.4.1 Parameters

The Σ-II Series SERVOPACK provides many functions and has parameters that allow the user to specify functions and perform fine adjustments.



A Panel Operator, hand-held Digital Operator, or Device-Net commands is used to set parameters.

Parameters are divided into the following three groups.

Parameter	Function
Pn000 to Pn819	Specify SERVOPACK functions, set servo gains, etc.
Fn000 to Fn013	Execute auxiliary functions such as FEED operations and zero point searches.
Un000 to Un00D	Monitor the motor speed and torque reference value on the panel display.

6

6.4.2 Input Circuit Signal Allocation

The allocation of the sequence input signal circuit when the NS500 Unit is mounted on the SGDH SERVOPACK is not changed. It will be as follows:

Terminal Numbers	Input Terminal Name	Symbol	Name
40	SI0	---	---
41	SI1	DEC	Deceleration limit switch
42	SI2	P-OT	Forward run prohibited
43	SI3	N-OT	Reverse run prohibited
44	SI4	EXTP	External signal positioning
45	SI5	ZERO	Zero point signal
46	SI6	---	---

6.4.3 Output Circuit Signal Allocations

Output signal functions can be allocated to the sequence signal output circuits shown below.

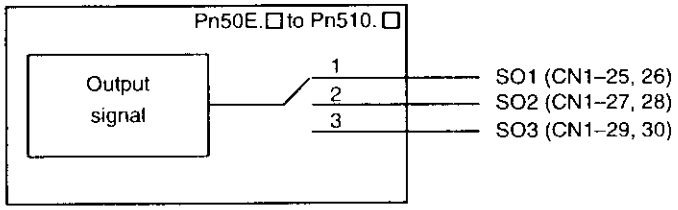
In general, allocate signals according to the standard settings in the following table.

CN1 Connector Terminal Numbers	Output Terminal Name	Factory Setting		Standard Setting	
		Symbol	Name	Symbol	Name
25	SO1	/COIN+	Positioning completed	/COIN+	Positioning completed
26		/COIN–		/COIN–	
27	SO2	/TGON+	Rotation detection	/BK+	Brake interlock
28		/TGON–		/BK–	
29	SO3	/S-RDY+	Servo ready	/S-RDY+	Servo ready
30		/S-RDY–		/S-RDY–	

The following table shows the output signal selection parameters and their factory settings and standard settings.

Pn50E	**Output Signal Selections 1**	**Factory Setting: 3211**	**Standard Setting: 3001**
Pn50F	**Output Signal Selections 2**	**Factory Setting: 0000**	**Standard Setting: 0200**
Pn510	**Output Signal Selections 3**	**Factory Setting: 0000**	**Standard Setting: 0000**

Select the CN1 connector terminals that will output the signals.



Output Signal	Parameter		Description
	Number	Setting	
Positioning Completed (/COIN)	Pn50E.0	0	Disabled (Not used for the output signal on the left.)
		1	Outputs the signal on the left from the SO1 (CN1-25 and 26) output terminal.
		2	Outputs the signal on the left from the SO2 (CN1-27 and 28) output terminal.
		3	Outputs the signal on the left from the SO3 (CN1-29 and 30) output terminal.

Output Signal	Parameter		Description
	Number	Setting	
Speed Coincidence Detection (/V-CMP)	Pn50E.1	0 to 3	Same as Pn50E.0*
Rotation Detection (/TGON)	Pn50E.2	0 to 3	Same as Pn50E.0
Servo Ready (/S-RDY)	Pn50E.3	0 to 3	Same as Pn50E.0
Torque Limit Detection (/CLT)	Pn50F.0	0 to 3	Same as Pn50E.0
Speed Limit Detection (/VLT)	Pn50F.1	0 to 3	Same as Pn50E.0
Brake Interlock (/BK)	Pn50F.2	0 to 3	Same as Pn50E.0
Warning (/WARN)	Pn50F.3	0 to 3	Same as Pn50E.0
Near (/NEAR)	Pn510.0	0 to 3	Same as Pn50E.0
Phase C Detection (/C-PULS)	Pn510.1	0 to 3	Same as Pn50E.0

* Always OFF when an NS500 Unit is mounted.

Note "Same as Pn50E.0" means output signals are disabled or allocated to output terminals SO1 to SO3 through parameter settings 0 to 3.

Signals are output with OR logic when multiple signals are allocated to the same output circuit. Signals that are not detected are invalid.

■ Output Signal Reversal

The following parameter can be used to reverse the signals output on output terminals SO1 to SO3.

Pn512	Output Signal Reversal Settings	Factory Setting: 0000	Position Control

The settings specify which of the connector CN1 output signals are to be reversed.

Output Terminals	Parameter		Description
	Number	Setting	
SO1 (CN1-25, 26)	Pn512.0	0	Output signal not reversed.
		1	Output signal reversed.
SO2 (CN1-27, 28)	Pn512.1	0	Output signal not reversed.
		1	Output signal reversed.
SO3 (CN1-29, 30)	Pn512.2	0	Output signal not reversed.
		1	Output signal reversed.
Reserved	Pn512.3	---	---

6.4.4 Analog Monitors

The analog monitors can be changed by changing the PN003.0 and Pn003.1 parameter settings.

Pn003.0	**Analog Monitor 1**	**Factory Setting: 2**	**Position Control**
Pn003.1	**Analog Monitor 2**	**Factory Setting: 0**	**Position Control**

The monitor signals and units and the observation gains when observing using the analog monitor (CN5) are shown on the following table.

Pn003.0 and Pn003.1 Settings	Monitor Signal	Analog Monitor (CN5) Observed Gain
0	Servomotor speed	1 V/1000 min^{-1}
1	Speed reference	1 V/1000 min^{-1}
2	Torque reference	1 V/100 % rated torque
3	Position error	0.05 V/1 reference units
4	Position error	0.05 V/100 reference units
5	Reference pulse frequency (Servomotor speed conversion)	1 V/1000 min^{-1}
6	Servomotor speed	1 V/250 min^{-1}
7	Servomotor speed	1 V/125 min^{-1}
8 to F	Reserved motor signal	–

INFO

Refer to *6.5 Analog Monitors* in the *Σ-II Series SGM□H/SGDH User's Manual: Design and Maintenance* (SIE-S800-32.2) for information on monitoring methods of analog monitors.

6.5 Setting Stop Functions

This section describes the procedure used to stably stop the SERVOPACK.

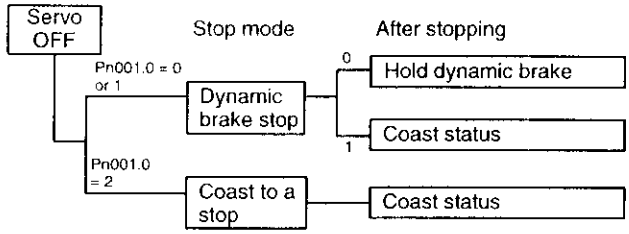
6.5.1 Using the Dynamic Brake

To stop the servomotor by applying the dynamic brake (DB), set the desired mode in the following parameter. The servomotor will stop due to equipment friction if the dynamic brake is not applied.

Pn001.0	Servo OFF or Alarm Stop Mode	Factory Setting: 0	Position Control

The SERVOPACK turns OFF under the following conditions:

- When the SV_OFF command is sent.
- A servo alarm occurs.
- Power is turned OFF.



Specify the Stop Mode if any of these occurs during servomotor operation.

Pn001.0 Setting	Description
0	Uses the dynamic brake to stop the servomotor. Maintains dynamic brake after the servomotor stops. *1
1	Uses the dynamic brake to stop the servomotor. Releases dynamic brake after the servomotor stops, and the servomotor coasts to a stop.
2	Coasts the servomotor to a stop. *2 The servomotor is turned OFF and stops due to equipment friction.

* 1. If the servomotor is stopped or moving at extremely low speed, it will coast to a stop.

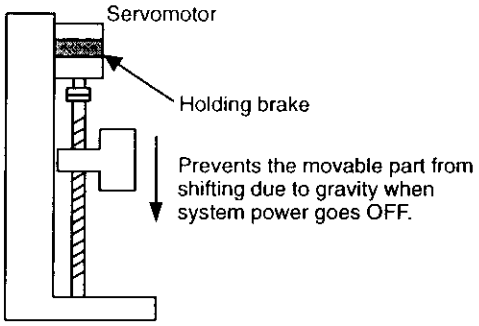
* 2. A dynamic brake is used when the control power and main power are turned OFF.

IMPORTANT

The dynamic brake is an emergency stop function. Do not repeatedly start and stop the servomotor using the SV_ON/SV_OFF command or by repeatedly turning power ON and OFF.

6.5.2 Using the Holding Brake

The holding brake is used when a Servodrive controls a vertical axis. In other words, a servomotor with brake prevents the movable part from shifting due to gravity when system power goes OFF.

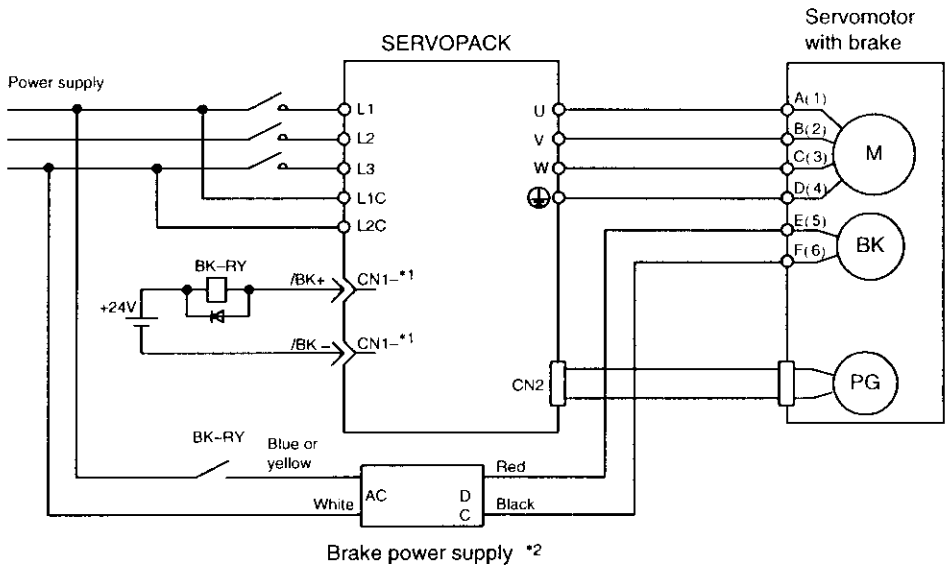


IMPORTANT

The brake built into the SGM□H servomotor with brakes is a de-energization brake, which is used only to hold and cannot be used for braking. Use the holding brake only to hold a stopped motor. Brake torque is at least 120% of the rated servomotor torque.

■ Wiring Example

Use the SERVOPACK sequence output signal /BK and the brake power supply to form a brake ON/OFF circuit. The following diagram shows a standard wiring example.



BK-RY: Brake control relay

*1: The output terminal signal is allocated with Pn50F.2

*2: Brake power supplies are available in 200-V and 100-V models.

Output to /BK	Brake Interlock Output	Position Control

This output signal controls the brake when using a servomotor with a brake and does not have to be connected when using a servomotor without a brake.

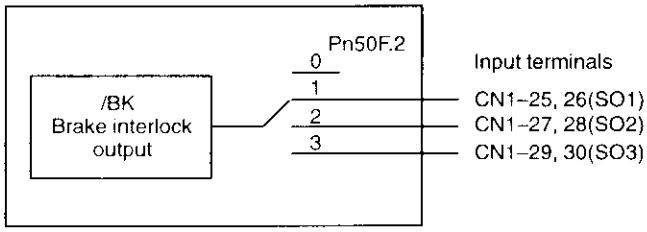
ON: Closed or low level	Releases the brake.
OFF: Open or high level	Applies the brake.

Related Parameters

Pn005	Brake operation
Pn506	Time Delay from Brake Reference until Servo OFF
Pn507	Speed Level for Brake Reference Output during Motor Operation
Pn508	Timing for Brake Reference Output during Motor Operation

The output signal in the following parameter must be selected when the /BK signal is used.

Pn50F	Output Signal Selection 2	Factory Setting: 0000	Position Control



Select the /BK output terminal.

Parameter	Setting	Output Terminal (CN1)	
		*1	*2
Pn50F.2	0	---	---
	1	25	26
	2	27	28
	3	29	30

Note Signals are output with OR logic when multiple signals are allocated to the same output circuit. Set other output signals to a value other than that allocated to the /BK signal in order to output the /BK signal alone. Refer to *6.4.3 Output Circuit Signal Allocation.*

■ Brake Operation

Set whether the brake is applied using the SERVOPACK parameter.

Pn005.0	Brake Operation	Factory Setting: 0	Position Control

Pn005.0 Setting	Description
0	Performs brake operation using the SERVOPACK parameter.
1	Does not perform brake operation using the SERVOPACK parameter.

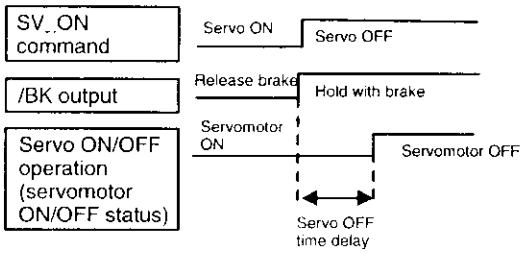
IMPORTANT When setting the Pn005.0 to 1, the SERVOPACK's parameters (Pn506, Pn507, Pn508) settings will be ignored.

■ Brake ON Timing

If the equipment moves slightly due to gravity when the brake is applied, set the following parameter to adjust brake ON timing.

Pn506	Time Delay from Brake Reference until Servo OFF	Unit: 10 ms	Setting Range: 0 to 50	Factory Setting: 0	Position Control

This parameter is used to set the output time from the brake control output signal /BK until the servo OFF operation (servomotor output stop) when a servomotor with a brake is used.



With the standard setting, the servo is turned OFF when the /BK signal (brake operation) is output. The equipment may move slightly due to gravity depending on equipment configuration and brake characteristics. If this happens, use this parameter to delay servo OFF timing.

This setting sets the brake ON timing when the servomotor is stopped. Use Pn507 and 508 for brake ON timing during operation.

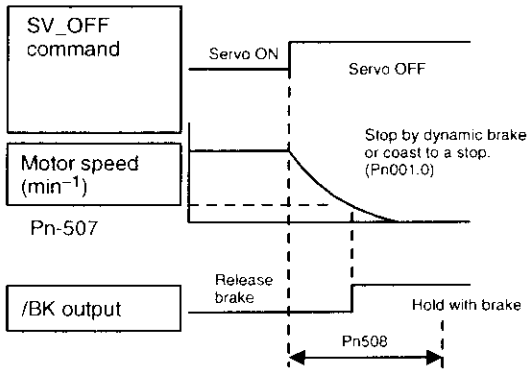
IMPORTANT The servomotor will turn OFF immediately if an alarm occurs. The equipment may move due to gravity in the time it takes for the brake to operate.

■ Holding Brake Setting

Set the following parameters to adjust brake ON timing so the holding brake is applied when the servomotor stops.

Pn507	**Brake Reference Output Speed Level during Motor Operation**	**Unit:** min^{-1}	**Setting Range:** 0 to 10000	**Factory Setting:** 100	**Position Control**
Pn508	**Timing for Brake Reference Output during Motor Operation**	**Unit:** 10 ms	**Setting Range:** 10 to 100	**Factory Setting:** 50	**Position Control**

Set the brake timing used when the servo is turned OFF by the SV_OFF command or when an alarm occurs during servomotor with brake operation.



Brake ON timing when the servomotor stops must be adjusted properly because servomotor brakes are designed as holding brakes. Adjust the parameter settings while observing equipment operation.

/BK Signal Output Conditions During Servomotor Operation

The circuit is open under either of the following conditions:

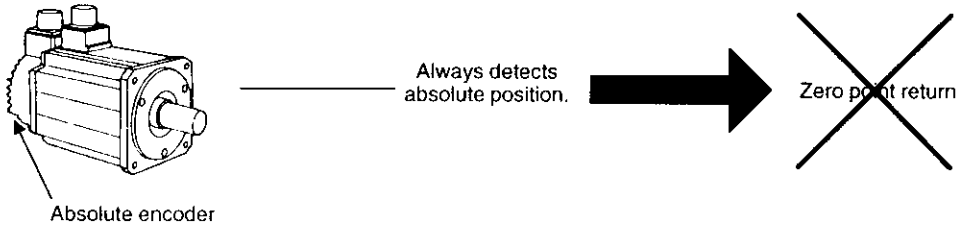
1	Motor speed drops below the setting at Pn507 after servo OFF.
2	The time set at Pn508 has elapsed since servo OFF.

The actual setting will be the maximum speed if Pn507 is set higher than the maximum speed.

6.6 Absolute Encoders

If a servomotor with an absolute encoder is used, a system to detect the absolute position can be made in the host controller. Consequently, operation can be performed without performing a zero point return immediately after the power is turned ON.

Motor SGM□H-□□□1□···With 16-bit absolute encoder
SGM□H-□□□2□···With 17-bit absolute encoder



6.6.1 Selecting an Absolute Encoder

Select the absolute encoder usage with the following parameter.

Pn002.2	Absolute Encoder Usage	Factory Setting: 0	Position Control

"0" in the following table must be set to enable the absolute encoder.

Pn002.2 Setting	Description
0	Use the absolute encoder as an absolute encoder.
1	Use the absolute encoder as an incremental encoder.

Note This parameter setting goes into effect when the power is turned OFF and ON again after the change has been made.

6.6.2 Absolute Encoder Setup

Perform the setup operation for the absolute encoder in the following circumstances:

- When starting the machine for the first time
- When an encoder backup alarm is generated
- When the SERVOPACK's power supply is turned OFF and the encoder's cable is removed

Perform the setup operation in one of the following ways.

- Refer to the *Σ-II Series SGM□H/SGDH User's Manual: Design and Maintenance* (SIE-S800-32.2) for details on the absolute encoder setup operation (Fn008) when a Digital Operator is used.
- Setup can also be performed using personal computer monitor software.

INFO

The absolute encoder setup operation is only possible when the servo is OFF. After the setup processing is finished, turn the power OFF and then ON again.

IMPORTANT

If the following absolute encoder alarms are displayed, the alarms must be cleared using the method described above for the setup operation. They cannot be cleared using the Alarm Reset Command.

- Encoder backup alarm (A.81)
- Encoder checksum alarm (A.82)

In addition, if a monitoring alarm is generated in the encoder, release the alarm by turning OFF the power.

6.6.3 Multiturn Limit Setting

6

When implementing absolute position detection systems for machines that turn m times in response to n turns in the load shaft, such as round tables, it is convenient to reset the multiturn data from the encoder to 0 every m turns. The Multiturn Limit Setting allows the value m to be set for the encoder.

Select the absolute encoder usage with the following parameter.

Pn002.2	Absolute Encoder Usage	Factory Setting:	Position Control
		0	

Set Pn002.2 to 0 to enable the absolute encoder.

Pn002.2 Setting	Description
0	Uses the absolute encoder as an absolute encoder.
1	Uses the absolute encoder as an incremental encoder.

TERMS

◆ Multiturn limit

The upper limit of multiturn data. The multiturn data will vary between 0 and the value of Pn205 (multiturn limit setting) when Pn002.2 is set to 0.

The multiturn limit is set in the SERVOPACK using the following parameter.

Pn205	Multiturn Limit Setting	Unit: rev	Setting Range: 0 to 65535	Factory Setting: 65535	Position Control

If the Multiturn Limit Setting is set to 65535 (factory setting), the multiturn data will vary from −32768 to 32767. If any other value is set, the multiturn data will vary from 0 to the setting of Pn205.

If the servomotor rotates in the negative direction from 0, the multiturn data will change to the value set for Pn205. If the servomotor rotates in the positive direction from the value set in Pn205, the multiturn data will change to 0. Set Pn205 to m − 1.

INFO Turn the power OFF and then ON after changing the setting of parameter Pn002.2 or Pn205.

The multiturn limit value in the encoder is factory set to 65535, the same as the SERVOPACK. If the multiturn limit value in the SERVOPACK is changed with Pn205 and then the SERVOPACK power is turned OFF and ON, the following alarm will occur.

Alarm Name: Multiturn Limit Disagreement

Alarm Display	Alarm Code Outputs			Description of Alarm
	ALO1	ALO2	ALO3	
A.CC	ON	OFF	ON	The multiturn limit value is different in the encoder and SERVOPACK.

Note ON signals are low level; OFF signals are high level.

When this alarm occurs, the multiturn limit in the encoder must be changed. This operation is performed in one of the following ways.

- Refer to the *Σ-II Series SGM□H/SGDH User's Manual: Design and Maintenance* (SIE-S800-32.2) for details on changing the multiturn limit setting (Fn013) using a Digital Operator.
- Setup can also be performed using the personal computer monitor software.

INFO The multiturn limit setting in the encoder can be changed only when the Multiturn Limit Disagreement alarm has occurred. After changing the setting, turn the power supply OFF and then ON.

⚠ **WARNING** The multiturn limit value must be changed only for special applications. Changing it inappropriately or unintentionally can be dangerous.

⚠ **WARNING** If the Multiturn Limit Disagreement alarm occurs, check the setting of parameter Pn205 in the SERVOPACK to be sure that it is correct. If Fn013 is executed when an incorrect value is set in Pn205, an incorrect value will be set in the encoder. The alarm will disappear even if an incorrect value is set, but incorrect positions will be detected, resulting in a dangerous situation where the machine will move to unexpected positions.

6.7 Digital Operator

6.7.1 Connecting the Digital Operator

There are two types of Digital Operator. One is a built-in operator incorporating a panel indicator and switches located on the front panel of the SERVOPACK. This type of Digital Operator is also called a Panel Operator. The other one is a Hand-held Digital Operator (i.e., the JUSP-OP02A-2 Digital Operator), which can be connected to the SERVOPACK through connector CN3 of the SERVOPACK.

There is no need to turn OFF the SERVOPACK to connect the Hand-held Digital Operator to the SERVOPACK. For details on how to use the Hand-held Digital Operator, refer to the *Σ-II Series SGM□H/SGDH User's Manual: Design and Maintenance* (SIE-S800-32.2).

6.7.2 Limitations in Using a Hand-held Digital Operator

When an NS500 Unit is mounted, the Hand-held Digital Operator has the following limitations.

Turn the power OFF and then ON after changing the setting of parameter the Pn002.2 or Pn205.

6

Normal Operation

The following commands are not supported when sent via DeviceNet if a Hand-held Digital Operator is connected or communications with a personal computer are started during normal operation.

- Writing SGDH parameters

6.7.3 Panel Operator Indicators

The Panel Operator indicators (LED) will not be lit in any of the following circumstances.

1. The indicators will not be lit for approximately 3 seconds when the power is turned ON.
2. The indicator will not be lit when the Hand-held Digital Operator is connected.
   It will be lit when the Hand-held Digital Operator is disconnected.
3. The indicator will not be lit momentarily when the following commands are received via DeviceNet or from a setup tool.
   - Writing SGDH parameters
   - Reading SGDH parameters

7

Using the NSxxx Setup Tool

This chapter describes how to set parameters and monitor basic operation of the NS500 Unit using the NSxxx Setup Tool.

7.1 Connection and Installation ..... 7 -2

7.1.1 Connecting the NS500 Unit ..... 7 -2

7.1.2 Installing the Software ..... 7 -2

7.2 How to Use ..... 7 -3

7.2.1 Screen Configuration at Startup ..... 7 -3

7.2.2 Functions Configuration ..... 7 -6

7.1 Connection and Installation

7.1.1 Connecting the NS500 Unit

■ Connector Cables

Connect the CN11 port on the NS500 Unit and the RS-232C port on the personal computer using the following cable.

Model	Name
DE9404559	SGD Monitor Cable

■ Cable Wiring

Wire the cables as follows:

CN11 Pin number	Symbol	Details	Personal computer pin number (9 pins)
1	TXD (red)	Serial data output	2
2	RXD (white)	Serial data input	3
3	GND (black)	Ground	5
4	GND (black)	Ground	5

7.1.2 Installing the Software

The following files are stored on the floppy disk for the NSxxx Setup Tool.

- NS_MMI.EXE (Execution unit)
- ParmDef.CFG (Data files)
- RES_JPN.DLL (DLL in Japanese)
- RES_ENG.DLL (DLL in English)
- ParmDef(Jpn).CFG (Data files in Japanese)
- ParmDef(Eng).CFG (Data files in English)

Copy these files to any directory on the personal computer.

IMPORTANT To use the files in English, copy ParmDef(Eng).CFG to ParmDef.CFG.

7.2 How to Use

7.2.1 Screen Configuration at Startup

Start the Setup Tool as follows:

1. Double-click the ***NS_MMI.exe*** file. The following communications setting screen will be displayed.

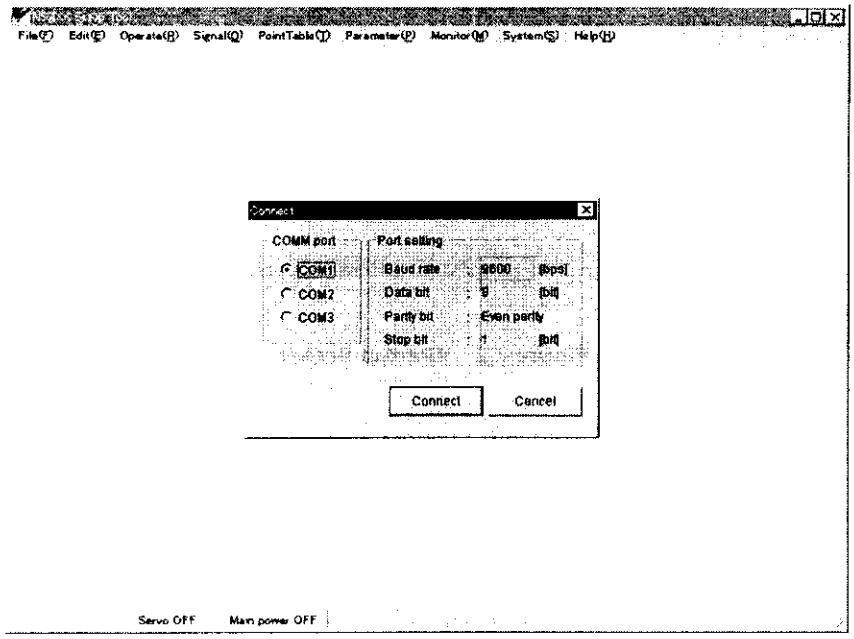


Figure 7.1 Communications setting screen

2. Perform one of the following operations.
   - If using any COM port other than COM1 on the personal computer, change the COMM PORT setting.
   - To use COM1, just click the ***Connect*** Button directly.

   Next, check the following:

   a) The communications power supply is being supplied via the SGDH control power supply to the NS500 Unit.

   b) The CN11 port on the NS500 Unit is connected to the personal computer via a communications cable.

The following startup screen will be displayed.

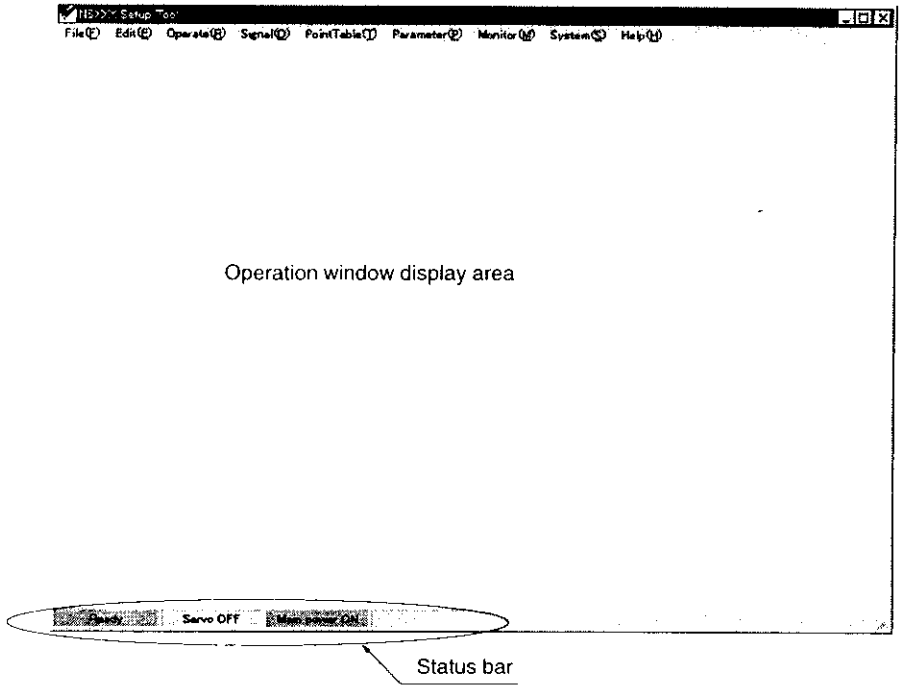
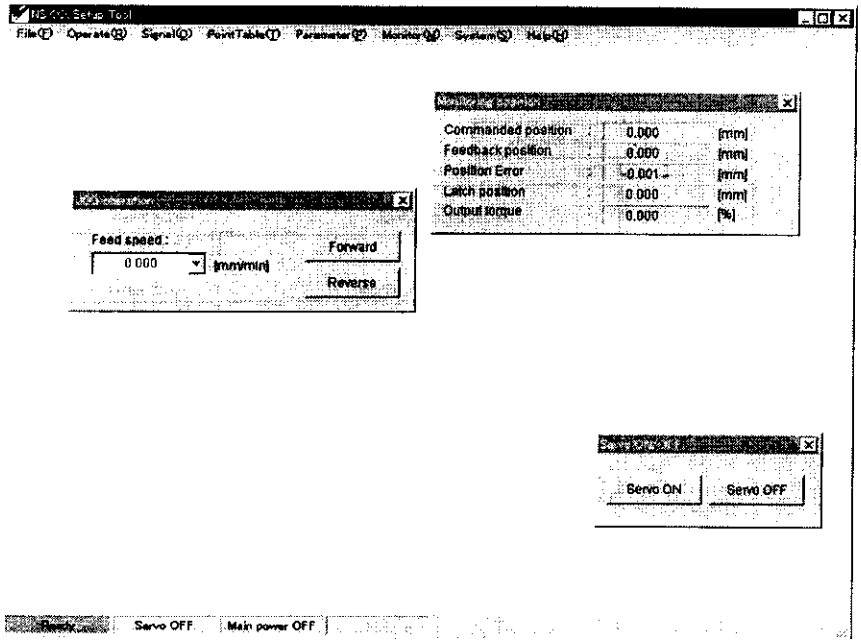

File(F) Edit(E) Operate(B) Signal(O) PointTable(T) Parameter(P) Monitor(M) System(S) Help(H)
Operation window display area
Servo OFF
Status bar

Figure 7.2 Startup Screen

The following information is normally displayed on the status bar.

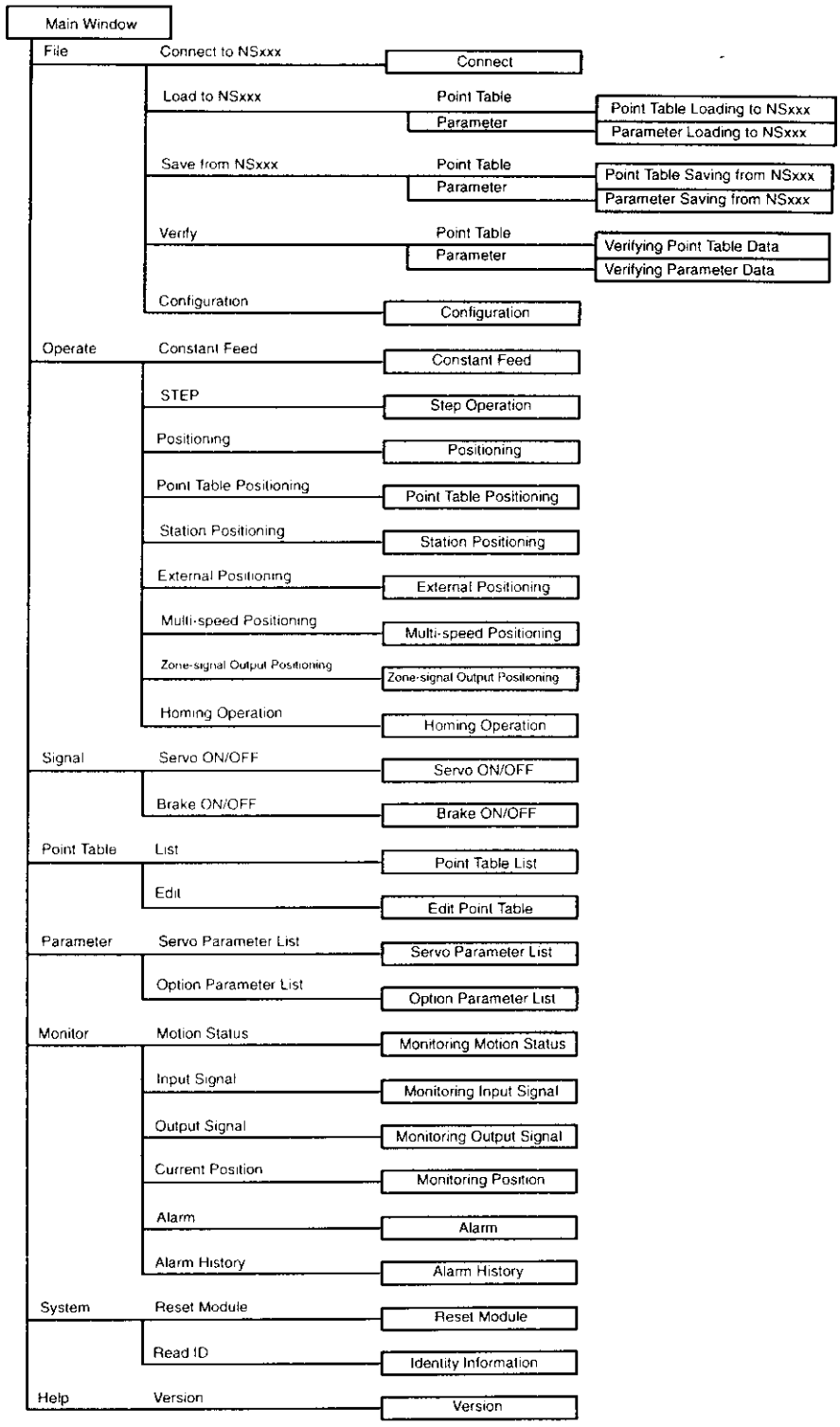
- Ready
  Displays whether or not the NS500 Unit is ready.
  If the Unit is ready, this icon will be lit green.
- Servo ON/OFF
  Displays if the SGDH servo is ON or OFF.
  If the servo is ON, this icon will be lit green.
- Main Power ON
  Displays if the main power supply to the SGDH is ON.
  If the main power supply is being supplied normally, this icon will be lit green.
- Alarm
  Displays if an alarm has occurred in the NS500 Unit or SGDH.
  If an alarm has occurred, this icon will be lit red.

Select an item from the menu bar and make NS500 Unit settings or perform simple operation, as shown below



7.2.2 Functions Configuration

The functional configuration of the Setup Tool is shown in the following diagram.



File Menu

1. Connect to NSxxx

   Starts communications with the NS500 Unit.

2. Load to NSxxx

   Loads to the NS500 Unit the parameter file stored in the personal computer.

3. Save from NSxxx

   Saves to the personal computer the parameter data or point table data within the NS500 Unit.

4. Verify

   Compares the data stored in the personal computer and the data in the NS500 Unit.

5. Configuration

   Sets the units, etc.

Operate Menu

1. Constant Feed

   Performs constant feed speed.

2. STEP

   Performs step operation.

3. Positioning

   Sets the target position and performs positioning.

4. Point Table Positioning

   Performs positioning based on the specified data in the point table.

5. Station Positioning

   Performs positioning to the specified station.

6. External Positioning

   Sets the target position and performs positioning. If the external signal changes, the axis moves the distance set in the parameter and then stops.

7. Multi-speed Positioning

   Performs multi-speed positioning based on the set parameters.

8. Zone-signal Output Positioning

   Performs positioning while making notch outputs based on the set parameters.

9. Homing Operation

   Performs the zero point return.

■ Signal Menu

1. Servo ON/OFF

   Turns ON and OFF the SGDH servo.

2. Brake ON/OFF

   Turns ON and OFF the SGDH brake signal.

■ Point Table Menu

1. List

   Displays a list of the point table currently registered.

2. Edit

   Edits the point table.

■ Parameter Menu

1. Servo Parameter List

   Displays a table of SGDH parameters, which can be edited using the cursor.

2. Option Parameter List

   Displays a table of NS500 Unit parameters, which can be edited using the cursor.

■ Monitor Menu

1. Motion Status

   Displays the current execution status.

2. Input Signal

   Displays the status of the external input signals connected to the CN1 port on the SGDH and the CN4 port on the NS500 Unit.

3. Output Signal

   Displays the status of the external output signals connected to the CN1 port on the SGDH and the CN4 port on the NS500 Unit.

4. Current Position

   Displays the current position of the servomotor in reference units.

5. Alarm

   Displays any alarms that are currently occurring. You can also clear the alarms using this function.

6. Alarm History

   Displays to a maximum of 10 the most recent alarms that have occur. You can also clear the alarm history using this function.

■ System Menu

1. Reset Module

   Resets the NS500 Unit and the SGDH.

   When you reset the Unit, the parameters that have been changed will be stored in flash ROM.

2. Read ID

   Displays version information for the NS500 Unit and SGDH, etc.

■ Help Menu

- Version

  Displays version information for the Setup Tool.

8

Ratings, Specifications, and Dimensions

This chapter provides the ratings, specifications, and dimensions of SGDH SERVOPACKs.

8.1 Ratings and Specifications ..... 8 -2

8.2 Dimensional Drawings ..... 8 -4

8.2.1 NS500 Unit ..... 8 -4

8.1 Ratings and Specifications

The following table lists the rating and specifications of NS500 Unit.

Table 8.1 NS500 Unit Ratings and Specifications

Item		Details
Applicable SERVOPACK		All SGDH-□□□E models
Installation Method		Mounted on the SGDH SERVOPACK
Basic Specifications	**Power Supply Method**	Supplied from the SGDH control power supply.
	Power Consumption	1.3 W
	Consumption Current	250 mA
	External Dimensions [mm]	20 x 142 x 128 (W x H x D)
	Approx. Mass [kg] (lb)	0.2 (0.441)
PROFIBUS-DP Communications	**Baud Rate Setting**	The baud rate is automatically set by the Master between 9.6 Kbps and 12 Mbps.
	Station Address Setting	Select the address from 0 to 7D (0 to 125) using the rotary switches.
Command Format	**Operation Specifications**	Positioning using PROFIBUS-DP communications
	Reference Input	PROFIBUS-DP communications Commands: Motion commands (position, speed), and reading and writing parameters
Position Control Functions	**Acceleration/ Deceleration Method**	Linear single/double-step, asymmetric, exponential, S-curve
	Fully Closed Control	Possible
Input Signals	**Fixed Allocation to SGDH CN1 Connector**	Forward/reverse run prohibited, zero point return deceleration LS, zero point signal, external positioning signal
	NS500 Unit	Emergency stop signal
Output Signals	**SGDH CN1 Connector***	Servo alarm, brake interlock, servo ready, positioning completion
	NS500 Unit	Notch 1, notch 2

Item		Details
Internal Functions	Position Data Latch Function	Position data latching is possible using phase C, zero point signals, and external signals.
	Protection	Parameters damage, parameter setting errors, communications errors, etc.
	LED Indicators	ERR: Module Error COMM: Communications Status Error

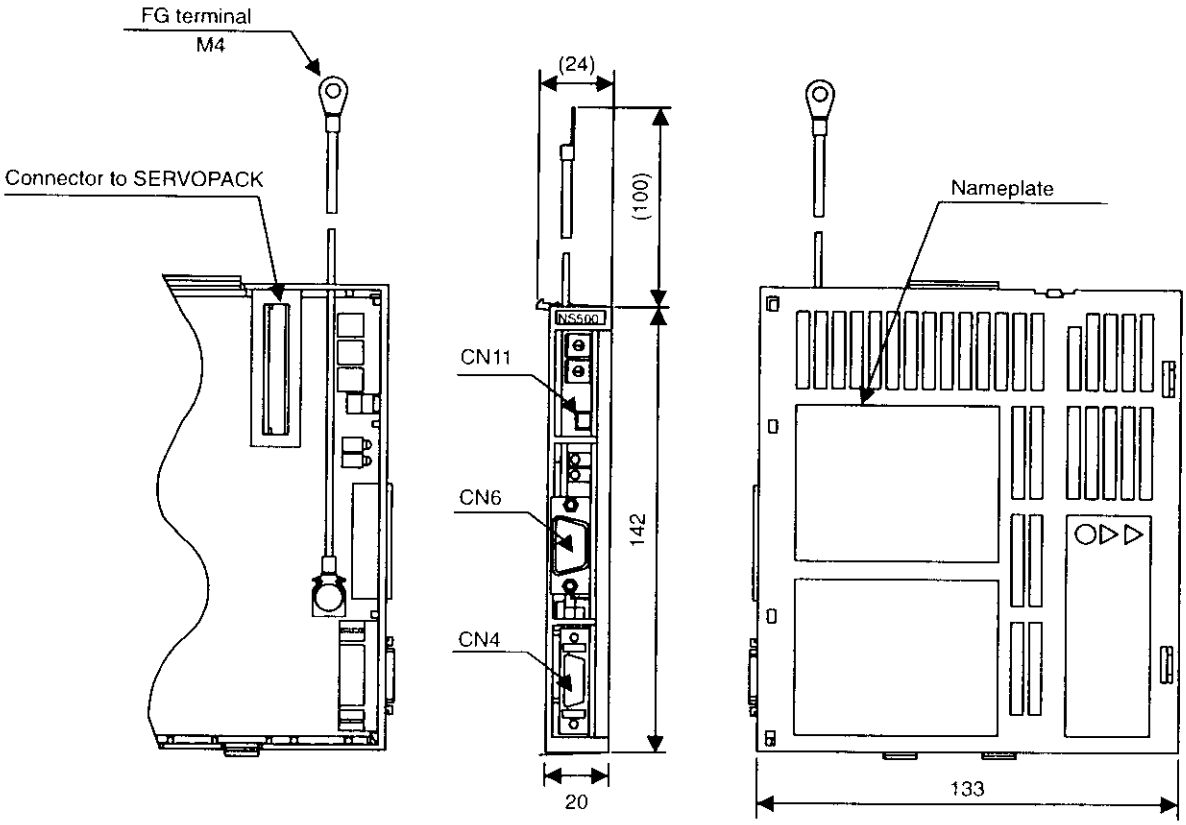
* The allocation of the following output signals can be changed using parameter settings: Brake interlock, servo ready, positioning completion.

8.2 Dimensional Drawings

Dimensional drawings of the NS500 Unit and SERVOPACKs are shown below.

8.2.1 NS500 Unit

Dimensions of the NS500 Unit are shown below.



Approx. mass: 0.2 kg (0.661 lb)

8

9

Error Diagnosis and Troubleshooting

This chapter describes error diagnosis and troubleshooting.
In addition, troubleshooting procedures are described for problems which cause an alarm display and for problems which result in no alarm display.

9.1 Troubleshooting with Alarm Displays ..... 9 -2
9.2 Troubleshooting Problems with No Alarm Display ..... 9 -38
9.3 Alarm Display Table ..... 9 -40
9.4 Warning Codes ..... 9 -43

9.1 Troubleshooting with Alarm Displays

Problems that occur in the Servodrives are displayed on the panel operator as "A.□□" or "CPF-□□". "A.– –", however, does not indicate an alarm. Refer to the following sections to identify the cause of an alarm and the action to be taken.

Contact your Yaskawa representative if the problem cannot be solved by the described procedures..

■ A.02

A.02: Parameter Breakdown

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm

At power ON —— **A, B, C**

Cause		Remedy
A	Power turned OFF during parameter write. Alarm occurred at the next power ON.	• Initialize parameters using Fn005 and reinput user settings. • Replace SERVOPACK.
B	Circuit board (1PWB) is defective.	Replace SERVOPACK.
C	The NS500 Unit is defective.	Replace the NS500 Unit.

9

■ A.03

A.03: Main Circuit Encoder Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm

Cause		Remedy
A	Circuit board (1PWB or 2PWB) is defective.	Replace SERVOPACK.

■ A.04

A.04: Parameter Setting Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm

Cause		Remedy
A	An out-of-range parameter was previously set or loaded.	• Reset all parameters in range. • Otherwise, re-load the correct parameter.
B	Circuit board (1PWB) is defective.	Replace SERVOPACK.
C	The NS500 Unit is defective.	Replace the NS500 Unit.

■ A.05

A.05: Combination Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm

At power ON —— **A, B**

Cause		Remedy
A	The range of servomotor capacities that can be combined has been exceeded.	Replace the servomotor so that a suitable combination is achieved.
B	Encoder parameters have not been written properly.	Replace the servomotor.

■ A.10

A.10: Overcurrent or Heat Sink Overheated

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

During servomotor operation — **A, B, D, E, F, G, H**

When SERVO ON (/S-ON) signal turned ON — **C, D**

At power ON — **C**

	Cause	Remedy
A	Wiring shorted between SERVOPACK and servomotor.	Check and correct wiring.
B	Servomotor phase U, V, or W shorted.	Replace servomotor.
C	• Circuit board (PWB) is defective. • Power transistor is defective.	Replace SERVOPACK.
D	Current feedback circuit, power transistor, DB relay, or circuit board defective.	Replace SERVOPACK.
E	The ambient temperature of the SERVOPACK exceeded 55°C.	Alter conditions so that the ambient temperature goes below 55°C.
F	The air flow around the heat sink is bad.	Follow the installation method and provide sufficient space as specified.
G	Fan stopped.	Replace SERVOPACK.
H	SERVOPACK is operating under an overload.	Reduce load.

Note: E to H can occur with all 400-V SERVOPACK models and 200-V SERVOPACK models for 1.5 to 5 kW.

■ A.30

A.30: Regenerative Error Detected

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	ON	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

During servomotor operation — **A, B**

Occurred when the control power turned ON — **D**

Occurred approximately 1 second after the main circuit power ON — **A, B, C**

Cause		Remedy
A	Regenerative transistor is abnormal.	Replace SERVOPACK.
B	Disconnection of the regenerative resistor.	Replace SERVOPACK or regenerative resistor.
C	Regenerative Unit disconnected (for an external regenerative resistor).	Check wiring of the external regenerative resistor.
D	SERVOPACK is defective.	Replace SERVOPACK.

■ A.32

A.32: Regenerative Overload

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	ON	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

During servomotor operation —— A, B

Cause		Remedy
A	Regenerative power exceeds the allowable value.	Use an external regenerative resistor that matches the regenerative power capacity.
B	Alarm occurs although an external regenerative resistor is used and the temperature rise of the regenerative resistor is small.	Reset the incorrect Pn600 parameter setting.

■ A.40

A.40: Main Circuit DC Voltage Error Detected: overvoltage

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

During servomotor operation — A, B, C, D

Occurred when the control power turned ON — E

Occurred when main circuit power turned ON — A, D

Cause		Remedy
A	The power supply voltage is not within the range of specifications.	Check power supply.
B	Load exceeds capacity of the Regenerative Unit.	Check specifications of load inertia moment and overhanging load.
C	Regenerative transistor is abnormal.	Replace SERVOPACK.
D	Rectifying diode is defective.	
E	SERVOPACK is defective.	

■ A.41

A.41: Main Circuit Voltage Error Detected: Undervoltage

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

During servomotor operation — **A, B, C**

Occurred when the control power turned ON — **D**

Occurred when main circuit power turned ON — **A, B, C**

	Cause	Remedy
A	The power supply voltage is not within the range of specifications.	Check power supply voltage.
B	Fuse blown.	Replace SERVOPACK.
D	Rectifying diode is defective.	
E	SERVOPACK is defective.	

■ A.51

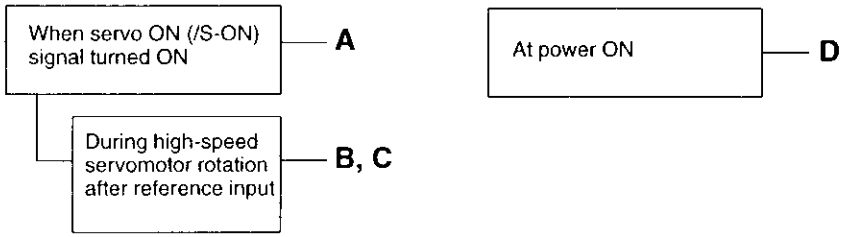
A.51: Overspeed

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	OFF	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm



Cause		Remedy
A	Servomotor wiring is incorrect.	Check and correct wiring. (Check phase-U, -V, and -W motor wiring errors.)
B	Position or speed reference input is too large.	Lower the reference input values.
C	Incorrect reference input gain settings.	Check and correct the parameter settings.
D	Circuit board (1PWB) is defective.	Replace SERVOPACK.

■ A.71

A.71: Overload: Instantaneous Maximum Load

The alarm output, the status when LEDs are lit, and the remedy procedure are identical to those of A.72 below.

■ A.72

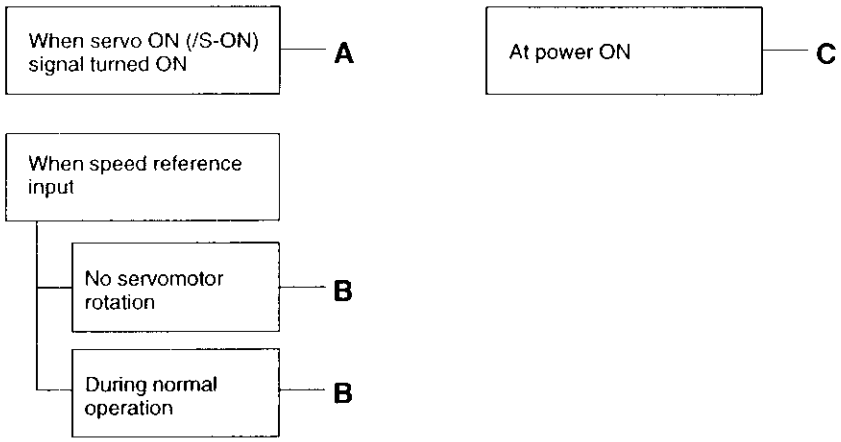
A.72: Overload: Continuous Maximum Load

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm



	Cause	Remedy
A	Servomotor wiring is incorrect or disconnected	Check wiring and connectors at servomotor.
B	Load greatly exceeds rated torque.	Reduce load torque and moment of inertia. Otherwise, replace with larger capacity servomotor.
C	Circuit board (1PWB) is defective.	Replace SERVOPACK.

■ A.73

A.73: Dynamic Brake Overload

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

When servo OFF signal turned ON — A

At power ON — B

Cause		Remedy
A	The product of the square of rotational motor speed and the combined moment of inertia of the motor and load (rotation energy) exceeds the capacity of the dynamic brake resistor built into SERVOPACK.	• Lower the rotational speed. • Lower the load moment of inertia. • Do not frequently use dynamic braking.
B	Circuit board (1PWB) is defective.	Replace SERVOPACK.

■ A.74

A.74: Overload of Surge Current Limit Resistor

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

When main circuit power turned ON or OFF — A

At power ON — B

Cause		Remedy
A	Frequently turning the main circuit power ON/OFF.	Do not repeatedly turn ON/OFF the main circuit power.
B	Circuit board (1PWB) is defective.	Replace SERVOPACK.

■ A.7A

A.7A: Heat Sink Overheated

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

During servomotor operation — **A, B, C, D**

When control power turned ON — **E**

Cause		Remedy
A	The ambient temperature of the SERVOPACK exceeds 55°C.	Alter conditions so that the ambient temperature goes below 55°C.
B	The air flow around the heat sink is bad.	Follow installation method and provide sufficient surrounding space as specified.
C	Fan stopped.	Replace SERVOPACK.
D	SERVOPACK is operating under overload.	Reduce load.
E	SERVOPACK is defective.	Replace SERVOPACK.

Note: This alarm display tends to occur only with a SERVOPACK of 30 W to 1,000 W.

■ A.81

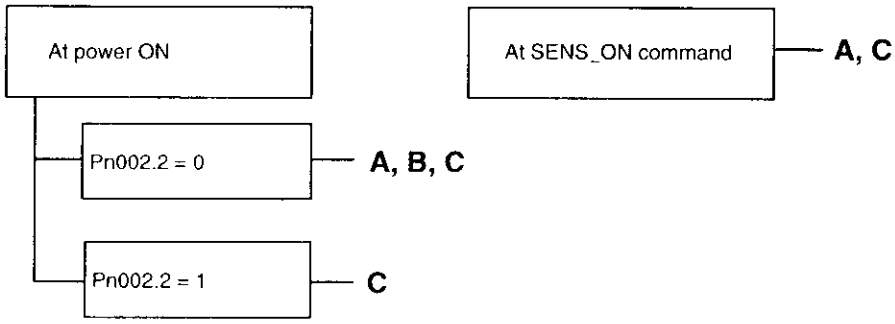
A.81: Absolute Encoder Backup Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm



	Cause	Remedy
A	The following power supplies to the absolute encoder all failed: • +5 V supply (supplied from SERVOPACK) • Battery	Follow absolute encoder set-up procedure.
B	Absolute encoder malfunctioned	Replace servomotor.
C	Circuit board (1PWB) is defective.	Replace SERVOPACK.

9

■ A.82

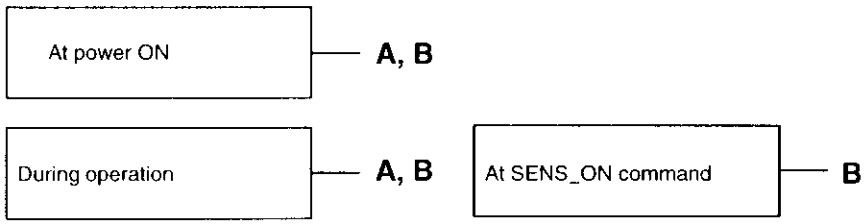
A.82: Absolute Encoder Checksum Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm



Cause		Remedy
A	Error during encoder memory check	• Follow absolute encoder setup procedure. • Replace servomotor if error occurs frequently.
B	Circuit board (1PWB) is defective.	Replace SERVOPACK.

■ A.83

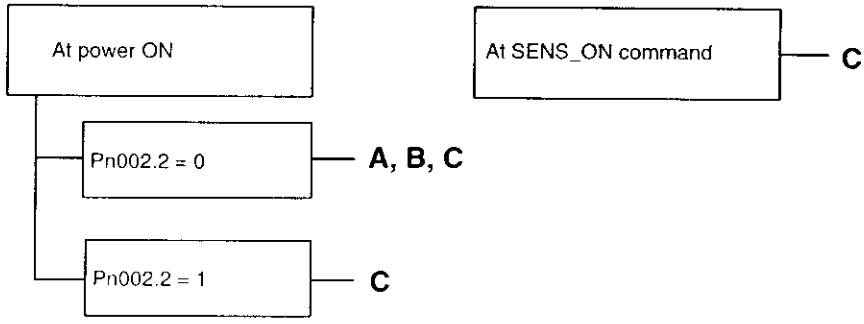
A.83: Absolute Encoder Battery Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm



	Cause	Remedy
A	• Battery is not connected. • Battery connection is defective.	Check and correct battery connection.
B	Battery voltage below specified value. Specified value: 2.7 V	Install a new battery while the control power to SERVOPACK is ON. After replacement, turn the power OFF and ON.
C	Circuit board (I PWB) is defective.	Replace SERVOPACK.

Note: No alarm will occur at the SERVOPACK if the battery error occurs during operation.

9

A.84

A.84: Encoder Data Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm

	Cause	Remedy
A	Encoder is defective.	Replace the servomotor if the error occurs frequently.
B	Operational error in encoder caused by external noise.	Check and correct wiring around the encoder as follows: • Grounding of the servomotor • Separation between the encoder cable and the servomotor power cable • Insertion of toroidal cores onto cables

■ A.85

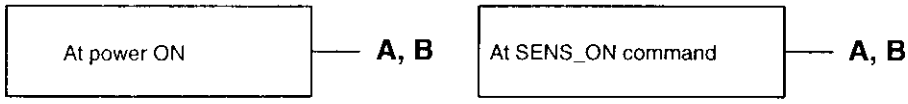
A.85: Absolute Encoder Overspeed

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm



Cause		Remedy
A	Absolute encoder turned ON at a speed exceeding 200 min^{-1}.	Turn ON power supply again with the servomotor stopped.
B	Circuit board (1PWB) is defective.	Replace SERVOPACK.

9

■ A.86

A.86: Absolute Encoder Overheated

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm

During servomotor operation — A, B

At power ON — C, D

Cause		Remedy
A	The ambient temperature of the servomotor is high.	Alter conditions so that the ambient temperature goes below 40°C.
B	Servomotor is operating under overload.	Reduce load.
C	Circuit board (IPWB) is defective.	Replace SERVOPACK.
D	Encoder is defective.	Replace servomotor.

■ A.94

A.94: Parameter Setting Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	ON	OFF	ON

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

When the command was sent — A

Cause		Remedy
A	A value outside the PROFIBUS-DP communications setting range was set.	Reset correctly.

■ A.95

A.95: Command Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	OFF	ON

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

When the command was sent — **A, B**

Cause		Remedy
A	Presently unable to receive the command that has been sent.	Adjust conditions to match the command. Refer to the specifications for each command.
B	Unsupported command.	Do not send unsupported commands.

■ A.98

A.98: Main Power OFF

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	ON	ON	ON

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

When main power supply OFF — **A, B**

Cause		Remedy
A	Contact between the power supply cable and the connector is faulty.	Correct the connector wiring.
B	Power Supply Unit is defective.	Check the Power Supply Unit.

■ A.9A

A.9A: Positioning Completed Timeout (Not Completed within the Time Set in Pn851)

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	OFF	ON	ON

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

During positioning — **A, B, C, D, E**

When positioning distance was short — **C, D**

Cause		Remedy
A	Positioning Completed Timeout setting (Pn851) is too small.	Correct the Positioning Completed Timeout setting (Pn851).
B	Positioning Loop Gain or Speed Loop Gain setting is too small.	Correct the Positioning Loop Gain or Speed Loop Gain setting.
C	Speed loop control is set to P control.	Set the speed loop control to PI control.
D	Mechanical friction is high.	Reduce mechanical friction.
E	The machine has hit something.	Remove any obstacles.

■ A.b1

A.b1: Reference Speed Input Read Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm

During servomotor operation — A, B

At power ON — C

Cause		Remedy
A	Error in reference read-in unit (A/D convertor, etc.)	Reset alarm and restart operation.
B	Reference read-in unit is defective. (A/D convertor, etc.)	Replace SERVOPACK.
C	Circuit board (1PWB) is defective.	Replace SERVOPACK.

■ A.b6

A.b6: Communications LSI Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).

Status and Remedy for Alarm

At power ON — A

Cause		Remedy
A	The NS500 Unit is defective.	Replace the NS500 Unit.

■ A.C1

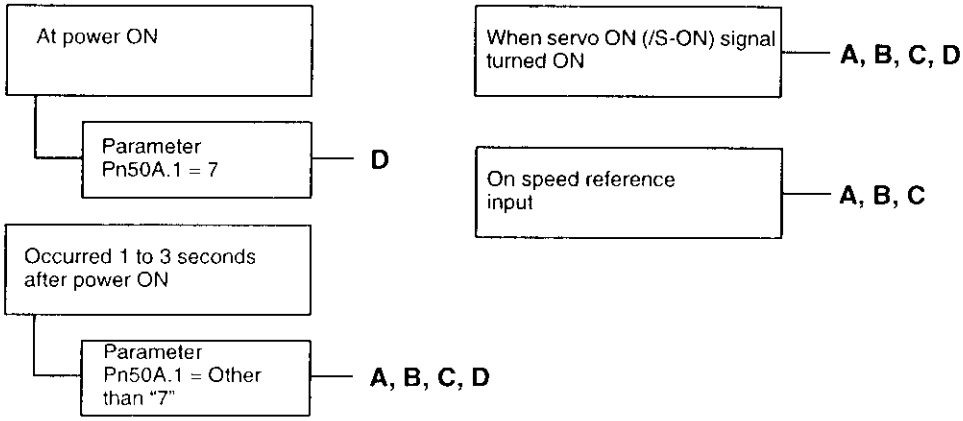
A.C1: Servo Overrun

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	OFF	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm


At power ON
Parameter Pn50A.1 = 7
D
Occurred 1 to 3 seconds after power ON
Parameter Pn50A.1 = Other than "7"
A, B, C, D
When servo ON (/S-ON) signal turned ON
A, B, C, D
On speed reference input
A, B, C

	Cause	Remedy
A	Servomotor wiring incorrect or disconnected.	Check the wiring and connectors at servomotor.
B	Encoder wiring incorrect or disconnected.	Check the wiring and connectors at encoder.
C	Encoder is defective.	Replace servomotor.
D	Circuit board (1PWB) is defective.	Replace SERVOPACK.

■ A.C6

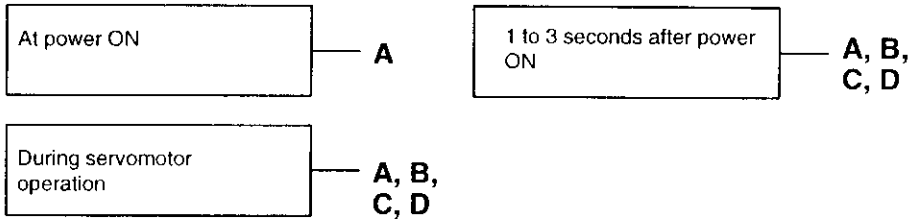
A.C6: Fully-closed Encoder Phase-A, -B Disconnection

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	OFF	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm



	Cause	Remedy
A	Circuit board (1PWB) is defective.	Replace SERVOPACK.
B	Encoder wiring error or faulty contact.	Check the wiring and check that the connector is fully inserted on the encoder.
C	There is noise in the encoder wiring.	Separate the encoder wiring from the main circuit.
D	Encoder is defective.	Replace servomotor.

■ A.C7

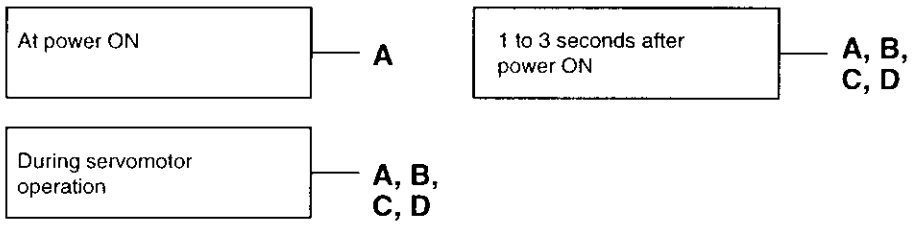
A.C7: Fully-closed Encoder Phase-C Disconnection

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	OFF	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm



Cause		Remedy
A	Circuit board (1PWB) is defective.	Replace SERVOPACK.
B	Encoder wiring error or faulty contact.	Check the wiring and check that the connector is fully inserted on the encoder.
C	There is noise in the encoder wiring.	Separate the encoder wiring from the main circuit.
D	Encoder is defective.	Replace servomotor.

■ A.CC

A.CC: Multiturn Limit Disagreement.

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	OFF	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

At power ON — **A, B**

Cause		Remedy
A	The setting of the Multiturn Limit Setting (Pn205) parameter in the SERVOPACK is incorrect.	Change parameter Pn205.
B	The multiturn limit has not been set in the encoder.	Check that the Multiturn Limit Setting (Pn205) parameter in the SERVOPACK is correct, and then execute the encoder multiturn limit setting change (Fn013) when a Multiturn Limit Disagreement (A.CC) occurs.

■ A.d0

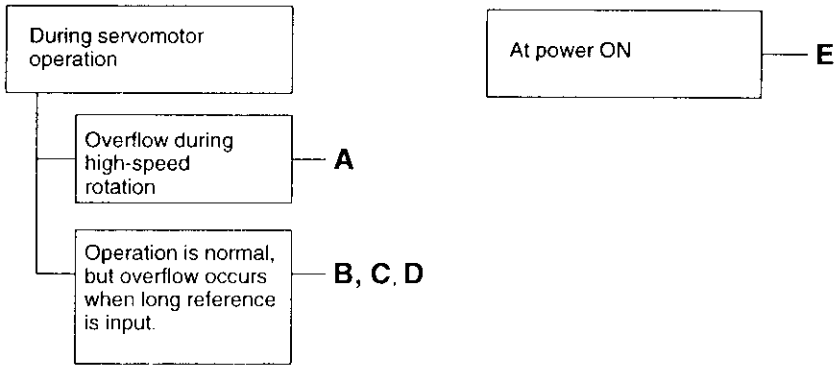
A.d0: Position Error Pulse Overflow

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
ON	ON	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state).ON: Output transistor is ON.

Status and Remedy for Alarm



Cause		Remedy
A	Servomotor wiring is incorrect or connection is poor.	Check wiring at servomotor.
B	SERVOPACK was not correctly adjusted.	Increase speed loop gain (Pn100) and position loop gain (Pn102).
C	Motor load was excessive.	Reduce load torque or moment of inertia. If problem not corrected, replace with a motor with larger capacity.
D	Position reference is too high.	• Reduce the acceleration/deceleration rate. • Change electronic gear ratio.

■ A.E0

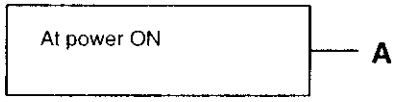
A.E0: No NS500 Unit

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm



Cause		Remedy
A	The NS500 Unit is defective.	Replace the NS500 Unit.

■ A.E1

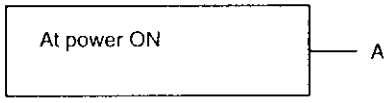
A.E1: NS500 Unit Timeout

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm



Cause		Remedy
A	The NS500 Unit is defective.	Replace the NS500 Unit.

■ A.E2

A.E2: Watchdog Counter Error in NS500 Unit

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

At power ON — A

Cause		Remedy
A	The NS500 Unit is defective.	Replace the NS500 Unit.

■ A.E7

A.E7: NS500 Unit Detection Error when SGDH power is ON

A.E7 occurs when the SGDH is used without the NS500 Unit after it has been used with the NS500 Unit.

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

NS500 Unit detection error — A, B

Cause		Remedy
A	The NS500 Unit is not mounted properly.	Check that NS500 Unit mounted correctly.
B	The NS500 Unit is not mounted.	Execute Fn014 from Digital Operator.

■ A.EA

A.EA: SERVOPACK Malfunction

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

Cause		Remedy
A	SERVOPACK is defective.	Replace SERVOPACK.

■ A.EB

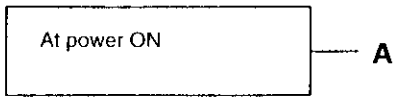
A.EB: SERVOPACK Initial Access Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm



Cause		Remedy
A	SERVOPACK is defective.	Replace SERVOPACK.

■ A.EC

A.EC: SERVOPACK WDC Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

Cause		Remedy
A	SERVOPACK is defective.	Replace SERVOPACK.
B	PROFIBUS-DP communications interrupted.	Turn the power ON again.

■ A.ED

A.ED: NS500 Unit Error

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	ON	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

During PROFIBUS-DP communications — A

Cause		Remedy
A	Command was interrupted.	Do not connect a Hand-held Digital Operator or start communications with a personal computer during command execution.

■ A.F1

A.F1: Power Line Open Phase

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	ON	OFF	OFF

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

Status and Remedy for Alarm

At main circuit power supply ON — A, B

Occurred when the control power turned ON — C

Cause		Remedy
A	One phase (L1, L2, or L3) of the main circuit power supply is disconnected.	• Check power supply. • Check wiring of the main circuit power supply. • Check QF, noise filter, magnetic contactor.
B	There is one phase where the line voltage is low.	Check power supply.
C	SERVOPACK is defective.	Replace SERVOPACK.

Note: A and B tend to occur in a SERVOPACK with a capacity of 500 W or higher.

■ CPF00

CPF00: Digital Operator Transmission Error 1

This alarm is not stored in the alarm trace-back function memory.

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
Not specified			

Status and Remedy for Alarm

At power ON. Digital Operator connected before SERVOPACK power turned ON. — **A, B, C, D**

Digital Operator connected to SERVOPACK while power turned ON. — **A, B, C, D**

Cause		Remedy
A	Cable defective or poor contact between Digital Operator and SERVOPACK	• Check connector connections. • Replace cable.
B	Malfunction due to external noise	Separate Digital Operator and cable from noise source.
C	Digital Operator is defective.	Replace Digital Operator.
D	SERVOPACK is defective.	Replace SERVOPACK.

9

■ CPF01

CPF01: Digital Operator Transmission Error 2

This alarm is not stored in the alarm trace-back function memory.

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
Not specified			

Status and Remedy for Alarm

During operation — **A, B, C, D**

Cause		Remedy
A	Cable defective or poor contact between Digital Operator and SERVOPACK	• Check connector connections. • Replace cable.
B	Malfunction due to external noise	Separate Digital Operator and cable from noise source.
C	Digital Operator is defective.	Replace Digital Operator.
D	SERVOPACK is defective.	Replace SERVOPACK.

■ A.– –

A.– –: Normal Operation

This is not an alarm display.

Display and Outputs

Alarm Outputs			
Alarm Code Outputs			ALM Output
ALO1	ALO2	ALO3	
OFF	OFF	OFF	ON

Note: OFF: Output transistor is OFF (alarm state). ON: Output transistor is ON.

9.2 Troubleshooting Problems with No Alarm Display

Refer to the tables below to identify the cause of a problem which causes no alarm display and take the remedy described.

Turn OFF the servo system power supply before commencing the shaded procedures.

Contact your Yaskawa representative if the problem cannot be solved by the described procedures.

Table 9.1 Troubleshooting Table with No Alarm Display

Symptom	Cause	Inspection	Remedy
Servomotor does not start.	Power not connected	Check voltage between power supply terminals.	Correct the power circuit.
	Loose connection	Check terminals of connectors (CN1, CN2).	Tighten any loose parts.
	Connector (CN1) external wiring incorrect	Check connector (CN1) external wiring.	Refer to connection diagram and correct wiring.
	Servomotor or encoder wiring disconnected	–	Reconnect wiring.
	Overloaded.	Run under no load.	Reduce load or replace with larger capacity servomotor.
	Encoder type differs from parameter setting.	Check the type of encoder being used.	Set parameter Pn002.2 to the encoder type being used.
	P-OT and N-OT inputs are turned OFF.	Refer to *6.3*.	Turn P-OT and N-OT input signals ON.
	Software limit reached	Refer to *4.3.3*.	Operate the servomotor within software limits.
Servomotor does not run.	Motion commands have not been sent.	Check using PROFIBUS-DP communications or the PROFIBUS-DP monitor.	Send the motion commands.
			Send Servo ON command.
Servomotor moves instantaneously, then stops.	Servomotor or encoder wiring incorrect.	–	Refer to *Chapter 3 Connectors* and correct wiring.
Servomotor speed unstable	Wiring connection to motor is defective.	Check connection of phase-U, -V, and -W power leads encoder connectors.	Tighten any loose terminals or connectors.

Symptom	Cause	Inspection	Remedy
Servomotor vibrates at approximately 200 to 400 Hz.	Speed loop gain value is too high.	–	Reduce speed loop gain (Pn100) preset value.
High rotation speed overshoot on starting and stopping	Speed loop gain value is too high.	–	Reduce speed loop gain (Pn100) preset value. Increase integration time constant (Pn101).
	Speed loop gain value too low compared to position loop gain value.	–	Increase speed loop gain (Pn100) preset value. Reduce the integration time constant (Pn101).
Servomotor overheated	Ambient temperature is too high.	Measure servomotor ambient temperature.	Reduce ambient temperature to 40°C max.
	Servomotor surface is dirty.	Visual check	Clean dust and oil from motor surface.
	Overloaded	Run under no load.	Reduce load or replace with larger capacity servomotor.
Abnormal noise	Mechanical mounting is incorrect.	Check if servomotor mounting screws loose.	Tighten mounting screws.
		Check if coupling not centered.	Center coupling.
		Check if coupling unbalanced.	Balance coupling.
	Bearing is defective.	Check noise and vibration near bearing.	Consult your Yaskawa representative if defective.
	Machine causing vibrations	Check foreign object intrusion, damage or deformation of driving parts of machine.	Consult with machine manufacturer if defective.

9.3 Alarm Display Table

Table 9.2 Alarm Display Table

Alarm Display	Alarm Code Outputs			ALM Output	Alarm Name	Description
	ALO 1	ALO 2	ALO 3			
A.02	OFF	OFF	OFF	OFF	Parameter Breakdown*2	EEPROM data of SERVOPACK is abnormal.
A.03					Main Circuit Encoder Error	Detection data for power circuit is abnormal.
A.04					Parameter Setting Error*2	The parameter setting is out of the allowable setting range.
A.05					Combination Error	SERVOPACK and servomotor capacities do not match each other.
A.10	ON	OFF	OFF	OFF	Overcurrent or Heat Sink Overheated*2	An overcurrent flowed through the IGBT. Heat sink of SERVOPACK was overheated.
A.30	ON	ON	OFF	OFF	Regeneration Error	• Regenerative resistor is defective. • Regenerative transistor is defective.
A.32					Regenerative Overload	Regenerative energy exceeds regenerative resistor capacity.
A.40	OFF	OFF	ON	OFF	Overvoltage *3	Main circuit DC voltage is excessively high.
A.41					Undervoltage *3	Main circuit DC voltage is excessively low.
A.51	ON	OFF	ON	OFF	Overspeed	Rotational speed of the motor is excessively high.
A.71	ON	ON	ON	OFF	Overload for Instantaneous Maximum Load	The motor was operating for several seconds to several tens of seconds under a torque largely exceeding ratings.
A.72					Overload for Continuous Maximum Load	The motor was operating continuously under a torque largely exceeding rating.
A.73					Dynamic Brake Overload	When the dynamic brake was applied, rotational energy exceeded the capacity of dynamic brake resistor.
A.74					Overload of Surge Current Limit Resistor	The main circuit power was frequently turned ON and OFF.
A.7A					Heat Sink Overheated*1	The heat sink of SERVOPACK is overheated.

Alarm Display	Alarm Code Outputs			ALM Output	Alarm Name	Description
	ALO 1	ALO 2	ALO 3			
A.81	OFF	OFF	OFF	OFF	Absolute Encoder Backup Error*2	All the power supplies for the absolute encoder have failed and position data was cleared.
A.82					Absolute Encoder Checksum Error*2	The checksum results of the absolute encoder memory are abnormal.
A.83					Absolute Encoder Battery Error	Battery voltage for the absolute encoder has dropped.
A.84					Encoder Data Error*2	Data in the encoder is abnormal.
A.85					Absolute Encoder Overspeed	The absolute encoder was rotating at high speed when the power was turned ON.
A.86					Encoder Overheated	The internal temperature of encoder is too high.
A.b1					Reference Speed Input Read Error	The A/D converter for reference speed input is defective.
A.b2					Reference Torque Input Read Error	The A/D converter for reference torque input is defective.
A.b6					Gate Array Error	Communications LSI error
A.bF					System Alarm *2	A system error occurred in the SERVOPACK.
A.C1	ON	OFF	ON	OFF	Servo Overrun Detected	The servomotor ran out of control.
A.C6					Fully-closed Loop Phase-A/B Disconnected	Phase A or B of the fully closed encoder was disconnected.
A.C7					Fully-closed Loop Phase-C Disconnected	Phase C of the fully closed encoder was disconnected.
A.C8					Absolute Encoder Clear Error and Multi-turn Limit Setting Error *2	The multi-turn for the absolute encoder was not properly cleared or set.
A.C9					Encoder Communications Error *2	Communications between SERVOPACK and encoder is not possible.
A.CA					Encoder Parameter Error *2	Encoder parameters are incorrect.
A.Cb					Encoder Echoback Error *2	Contents of communications with encoder are incorrect.
A.CC					Multi-turn Limit Disagreement	Different multi-turn limits have been set in the encoder and SERVOPACK.
A.d0	ON	ON	OFF	OFF	Position Error Pulse Overflow	Position error pulse exceeded parameter (Pn505).

Alarm Display	Alarm Code Outputs			ALM Output	Alarm Name	Description
	ALO 1	ALO 2	ALO 3			
A.E0	OFF	ON	ON	OFF	No NS500 Unit *2	No NS500 Unit installed.
A.E1					NS500 Unit Timeout *2	No response from the NS500 Unit.
A.E2					Watchdog Counter Error of NS500 Unit *2	WDC error in the NS500 Unit
A.E7					NS500 Unit Detection Error	No NS500 Unit was detected when was power supplied to the SGDH.
A.EA					SERVOPACK Malfunction*2	SERVOPACK is defective.
A.EB					SERVOPACK Initial Access Error *2	Initial processing failed.
A.EC					SERVOPACK WDC Error	SERVOPACK WDC error
A.ED					NS500 Unit Error	Command was interrupted.
A.F1	OFF	ON	OFF	OFF	Power Line Open Phase	One phase in the 3-phase main power supply is not connected.
CPF00	Not specified				Hand-held Digital Operator Transmission Error	Communications not possible between Hand-held Digital Operator (JUSP-OP02A-2) and the SERVOPACK (CPU error)
CPF01						
A.– –	OFF	OFF	OFF	ON	Not an error	Normal operation status.

Note: OFF: Output transistor is OFF (high). ON: Output transistor is ON (low).

* 1. This alarm display appears only within the range of 30 W to 1,000 W.

* 2. These alarms are not reset for the Alarm Reset Command. Eliminate the cause of the alarm and then turn OFF the power supply to reset the alarms.

* 3. For SERVOPACKs with a capacity of 6.0 kw or more, A.40 indicates a main circuit voltage error alarm. This means that either an overvoltage or an undervoltage has occurred at some stage.

9.4 Warning Codes

The warning codes and the relationship between ON/OFF warning code outputs are shown on the following table.

Normally, warning codes are not output. However, if the parameters are set for warning codes to be output, those outputs will be as indicated in table 9.3.

Table 9.3 Warning Codes and Warning Code Outputs

Warning Code	Warning Code Output			Servo Alarm Output	Warning Name	Description
	ALO1	ALO2	ALO3			
A.91	OFF	ON	ON	ON	Overload	This warning occurs before the overload alarms (A.71 or A.72) occur. If the warning is ignored and operation continues, an overload alarm may occur.
A.92	ON	OFF	ON	ON	Regenerative Overload	This warning occurs before the regenerative overload alarm (A.32) occurs. If the warning is ignored and operation continues, a regenerative overload alarm may occur.
A.94	ON	ON	OFF	ON	Parameter Setting Warning	A value outside the setting range was set using DeviceNet communications.
A.95	OFF	ON	OFF	ON	Command Warning	A command not supported in the product specifications was issued. The command reception conditions were not met.
A.98	ON	ON	ON	ON	Main Power OFF	The main power supply is not being supplied.
A.9A	ON	OFF	ON	ON	Positioning Completed Timeout	Positioning was not completed within the set time.

Note: OFF: Output transistor is OFF (high). ON: Output transistor is ON (low).

A

Alarm and Warning Codes

This appendix lists the alarm and warning codes within DeviceNet.

A.1 Alarm Codes A-2
A.2 Warning Codes A-4

A.1 Alarm Codes

Alarm codes are displayed on the front of the SGDH and, at the same time, can also be read as response data data at the host device connected via PROFIBUS-DP. Alarms are also displayed using the MS and NS indicators on the NS500 Unit.

The MS indicator is the module status; the NS indicator is the network status. The required indicator responses are shown in the table.

The alarm codes are shown below.

Table A.1. Alarm Codes

Code	MS	NS	Alarm Name	Description
A.02	Flashes Red.	–	Parameter Breakdown	EEPROM data of SERVOPACK is abnormal.
A.03	Lit Red.	–	Main Circuit Encoder Error	Detection data for power circuit is abnormal.
A.04	Flashes Red.	–	Parameter Setting Error	The parameter setting is out of the allowable setting range.
A.05	Flashes Red.	–	Combination Error	SERVOPACK and servomotor capacities do not match each other.
A.10	Flashes Red.	–	Overcurrent or Heat Sink Overheated	An overcurrent flowed through the IGBT. Heat sink of SERVOPACK was overheated.
A.30	Lit Red.	–	Regeneration Error	• Regenerative resistor is defective. • Regenerative transistor is defective.
A.32	Flashes Red.	–	Regenerative Overload	Regenerative energy exceeds regenerative resistor capacity.
A.40	Flashes Red.	–	Overvoltage	Main circuit DC voltage is excessively high.
A.41	Flashes Red.	–	Undervoltage	Main circuit DC voltage is excessively low.
A.51	Flashes Red.	–	Overspeed	Rotational speed of the motor is excessively high.
A.71	Flashes Red.	–	Overload for Instantaneous Maximum Load	The motor was operating for several seconds to several tens of seconds under a torque largely exceeding ratings.
A.72	Flashes Red.	–	Overload for Continuous Maximum Load	The motor was operating continuously under a torque exceeding ratings.
A.73	Flashes Red.	–	Dynamic Brake Overload	When the dynamic brake was applied, rotational energy exceeded the capacity of dynamic brake resistor.
A.74	Flashes Red.	–	Overload of Surge Current Limit Resistor	The main circuit power was frequently turned ON and OFF.
A.7A	Flashes Red.	–	Heat Sink Overheated	The heat sink of SERVOPACK is overheated.
A.81	Flashes Red.	–	Absolute Encoder Backup Error	All the power supplies for the absolute encoder have failed and position data was cleared.
A.82	Flashes Red.	–	Absolute Encoder Checksum Error	The checksum results of the absolute encoder memory are abnormal.
A.83	Flashes Red.	–	Absolute Encoder Battery Error	Battery voltage for the absolute encoder has dropped.

Code	MS	NS	Alarm Name	Description
A.84	Lit Red.	–	Encoder Data Error	Data in the encoder is abnormal.
A.85	Flashes Red.	–	Absolute Encoder Overspeed	The absolute encoder was rotating at high speed when the power was turned ON.
A.86	Flashes Red.	–	Encoder Overheated	The internal temperature of encoder is too high.
A.B1	Flashes Red.	–	Reference Speed Input Read Error	The A/D converter for reference speed input is defective.
A.B2	Flashes Red.	–	Reference Torque Input Read Error	The A/D converter for reference torque input is defective.
A.B6	Flashes Red.	–	Gate Array Error	Communications LSI error
A.BF	Flashes Red.	–	System Alarm	A system error occurred in the SERVOPACK.
A.C1	Flashes Red.	–	Servo Overrun Detected	The servomotor ran out of control.
A.C6	Flashes Red.	–	Fully-closed Loop Phase–A/B Disconnected	Phase A or B of the fully closed encoder was disconnected.
A.C7	Flashes Red.	–	Fully-closed Loop Phase–C Disconnected	Phase C of the fully closed encoder was disconnected.
A.C8	Lit Red.	–	Absolute Encoder Clear Error and Multi-turn Limit Setting Error	The multi-turn for the absolute encoder was not properly cleared or set.
A.C9	Flashes Red.	–	Encoder Communications Error	Communications between SERVOPACK and encoder is not possible.
A.CA	Lit Red.	–	Encoder Parameter Error	Encoder parameters are incorrect.
A.CB	Flashes Red.	–	Encoder Echoback Error	Contents of communications with encoder are incorrect.
A.CC	Flashes Red.	–	Multi-turn Limit Disagreement	Different multi-turn limits have been set in the encoder and SERVOPACK.
A.D0	Flashes Red.	–	Position Error Pulse Overflow	Position error pulse exceeded parameter (Pn505).
A.E0	–	–	No NS500 Unit	No NS500 Unit installed.
A.E1	–	–	NS500 Unit Timeout	No response from the NS500 Unit.
A.E2	–	–	Watchdog Counter Error of NS500 Unit	WDC error in the NS500 Unit
A.E7	–	Lit Red.	NS500 Unit Detection Error	No NS500 Unit was detected when was power supplied to the SGDH.
A.EA	Flashes Red.	–	SERVOPACK Malfunction	SERVOPACK is defective.
A.EB	Flashes Red.	–	SERVOPACK Initial Access Error	Initial processing failed.
A.EC	Flashes Red.	–	SERVOPACK WDC Error	SERVOPACK WDC error
A.ED	Lit Red.	–	NS500 Unit Error	Command was interrupted.
A.EE	Flashes Red.	–	NS500 Unit's Parameter Error	The parameters of the NS500 Unit contain abnormalities.
A.F1	Flashes Red.	–	Power Line Open Phase	One phase in the 3-phase main power supply is not connected.

A.2 Warning Codes

The warning codes are shown below.

Warning Code	MS LED	NS LED	Warning Name	Description
A.91	Flashes Red.	–	Overload	This warning occurs before the overload alarms (A.71 or A.72) occur. If the warning is ignored and operation continues, an overload alarm may occur.
A.92	Flashes Red.	–	Regenerative Overload	This warning occurs before the regenerative overload alarm (A.32) occurs. If the warning is ignored and operation continues, a regenerative overload alarm may occur.
A.94	Flashes Red.	–	Parameter Setting Warning	A value outside the setting range was set using PROFIBUS-DP communications.
A.95	Flashes Red.	–	Command Warning	A command not supported in the product specifications was issued. The command reception conditions were not met.
A.98	Flashes Red.	–	Main Power OFF	The main power supply is not being supplied.
A.9A	Flashes Red.	–	Positioning Completed Timeout	Positioning was not completed within the set time.

Σ-Ⅱ SERIES SGDH
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